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ASTOUNDING

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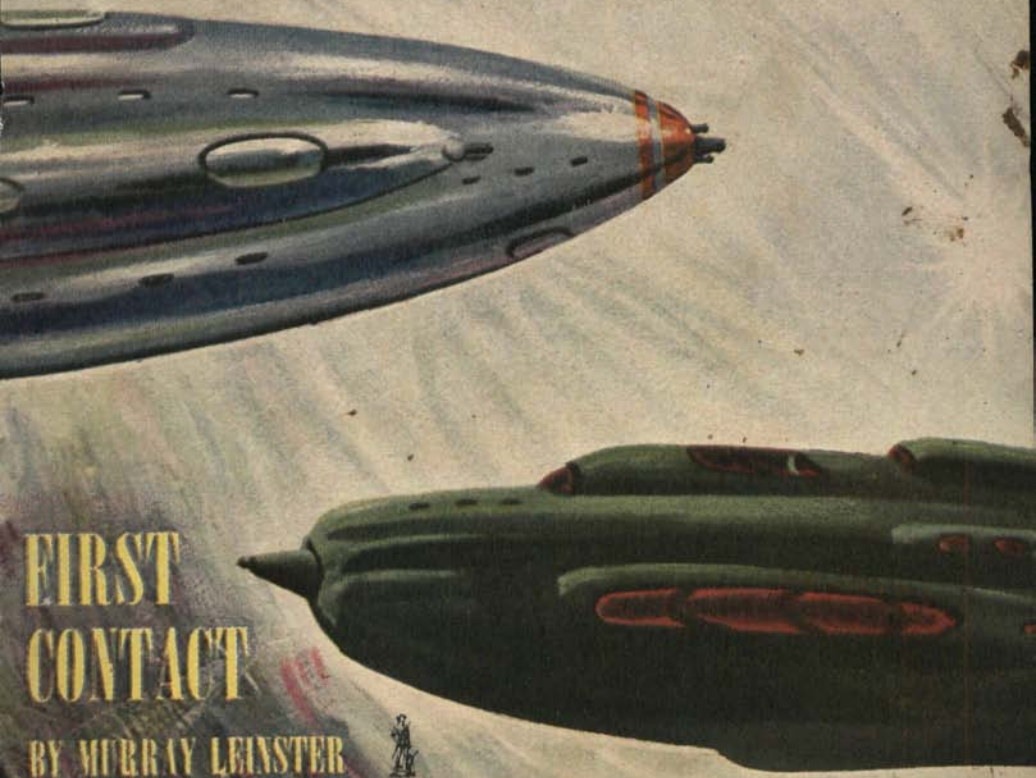

FIRST CONTACT

BY MURRAY LEINSTER

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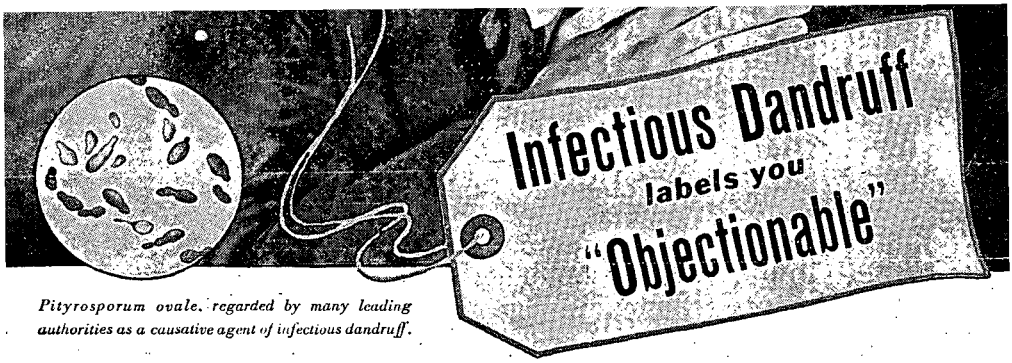

Pityrosporum ovale, regarded by many leading authorities as a causative agent of infectious dandruff.

Better do something about it now!

THOSE embarrassing flakes, those distressing scales, are a black mark against you . . . can stamp you as an objectionable person. Moreover, they're a warning that if you don't do something about the condition at once you may be in for a case of infectious dandruff.

Better Start Now

Why let infectious dandruff threaten the health of your scalp? Why not get started at once with an easy, delightful, tested treatment that has helped so many and may help you . . . a treatment that doesn't fool but gets after the germs accompanying the infection.

Just douse full strength Listerine Antiseptic on scalp and hair and follow with vigorous rotary, finger-tip massage for several minutes.

Combined with your regular hair-washing this acts as a precaution against infection. And, if the infection has got the jump on you, the treatment should be stepped up to morning and night frequency.

How Listerine Antiseptic Works

Listerine Antiseptic kills the "bottle bacillus" by millions, that stubborn, ugly little customer that many dermatologists say is a causative agency in this type of dandruff.

Used regularly, Listerine Antiseptic helps to get rid of those distressing flakes and troublesome scales and alleviates that bothersome itching so many sufferers complain about.

And, at the same time, it imparts a wonderful sense of freshness and exhilaration. Your scalp glows and tingles. Your hair feels delightfully fresh.

In clinical tests, Listerine Antiseptic, used twice daily, brought marked improvement within a month to 76% of the dandruff sufferers. Listerine Antiseptic is the same antiseptic that has been famous for more than 60 years in the field of oral hygiene.

LAMBERT PHARMACAL CO., *St. Louis, Mo.*

LISTERINE ANTISEPTIC *the Tested Treatment*

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The button they sewed on Tom's shirt 9 times

You know Tom, although perhaps you call him by another name. A shy, quiet boy who has suddenly become a man in the midst of war. Until he went into the Army Tom had never been away from home. But now he's three thousand miles from Mom and Dad . . . and a boy can become mighty lonely, even in an army of millions.

But here in the jungle, as though by some miracle, a Red Cross club has been established. And inside are girls . . . smiling, wholesome American girls who speak your language and are so much like sis . . . or the girl next door.

Tom knows that among a score of heart-warming jobs these Red Cross girls perform is the simple, homey act of helping a GI sew on buttons. So Tom has torn a button from his shirt and a Red Cross girl is sewing it on. And a little later Tom will tear off that same button again. In all (and this is an actual case), that button was sewed on a total of nine times.

The girls know, and smile indulgently. A little thing, yes, but such little, friendly services can give a big lift to the spirits of a lonely service man far away from home.

This is the only appeal the Red Cross will make to you this year. How much pain and suffering and loneliness the Red Cross will alleviate *depends on you.* For the Red Cross is entirely dependent upon *your* contributions. The task is greater today than ever. Won't you give as much as you can in this great humanitarian cause?

GIVE *NOW*—
GIVE *MORE*

Keep your
RED CROSS
at his side

STREET & SMITH PUBLICATIONS, INC.

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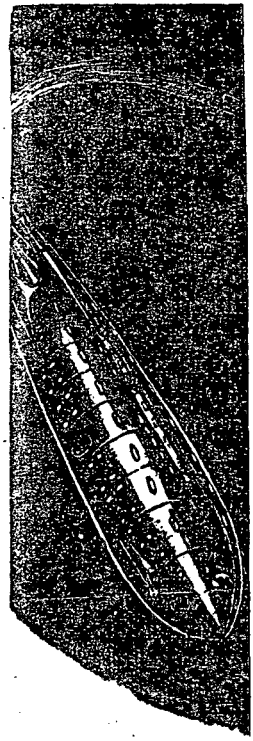

ASTOUNDING SCIENCE FICTION

Reg. U. S. Pat. Off.

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Editor
JOHN W. CAMPBELL, JR.

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Rockets and Bankruptcy

The Nazis have earned one honor that, bitterly though we do and will resent it, we cannot take from them; they were the first to build a ship capable of leaving Earth's atmosphere behind. As Willy Ley points out in his article, V-2, stripped of the twenty-two hundred pound warhead, equipped with an extra twenty-two hundred pounds of fuel and observer plus instruments, could leave—and, incidentally, may have left Earth. The Nazis have, therefore, won two places in history: they earned full-fold the right to the title of Most Brutal Gang in Centuries—and the title of First Rocketeers of History.

Why should they have done so, rather than Americans, English, Russians, or some other allied nationality? Particularly Americans, who are, unquestionably, the world's top gadget lovers.

Largely, I believe, because the rocket bomb is a weapon of bankruptcy and desperation. The man who has a good, sound, reliable, going business looks for more good, sound possibilities and developments —new products and processes that offer possibility of long-time, steady and reliable returns. He'll be more conservative, because he has time to work things out right, before plunging into it; he's not desperate for sudden success. The man just starting, not yet successful, can afford to, and must, take risks the already successful man will not. The man who is already teetering on the crumbling edge of bankruptcy will, in desperation, attempt wild feats in hopes, and in the belief that it can't be worse.

We don't ship carload lots of coal by air express; it doesn't play, except in the most special circumstances. Bombs can be shipped by airplane—that does pay off. It's expensive, expensive in treasure and in human lives. But the damage inflicted on the enemy is greater, because the planes come back better than nine times out of ten, and the bombs go where they have an excellent chance of doing real damage.

A bomber costs somewhere between one hundred thousand and seven hundred fifty thousand dollars, depending on type. How much a V-2 rocket costs, we don't know —but an ordinary Naval torpedo costs about ten thousand dollars, when made under the best, most economical conditions. The condition of German factories at present —thanks to airplanes—can be classed neither as "best" nor "most economical." The completed V-2

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must cost enough to run a fighter plane a stiff race.

In this country, where grain foods are almost unlimited in availability, and petroleum products are completely unlimited—so far as war demands go—there is an acute shortage of alcohol for the essential war-industrial uses. V-2 uses alcohol fuel. Liquid oxygen required by V-2 is expensive to produce. It is well understood now that a nation at war doesn't go financially bankrupt; the government passes laws, rigs the books, or issues decrees, so expense in terms of reichmarks doesn't matter. But those reichmarks are, essentially, a measure of human effort invested in the production of that product—instead of some other product. Liquid oxygen production requires power, either electrical or coal—German cities are freezing and dark—heavy, elaborate pumping machinery—bombed water systems must be repaired—compressed air is one of the most important industrial tools these days, particularly in decentralized factories—and skilled engineers. (Synthetic gasoline plants, synthetic nitrate plants, and chemical plants of all types require skilled high-pressure pump engineers—particularly when so many pumps, and engineers, have been damaged.)

The V-2 is a terribly expensive weapon. It's inefficient since its aim is enormously less exact than bombing planes. And it arrives so rapidly, it is less efficient; it buries its charge. It was terribly expensive, too, in its creation. Willy Ley tells something of the history of Peenemünde; the cost accounting sheets we can't, of course, investigate just now. But thousands of desperately needed technicians, skilled tool makers, machinists, and scientists were involved in that effort.

The Nazis have a successful rocket bomb worked out—successful only in the sense that it will fly to enormous altitude, and for a reasonable range. (Even the smallest fighters outrange it, of course, and can carry heavier loads.) As a scientific-technological achievement we must admit it as a genuine, Grade A triumph. As a military weapon, it can be considered only as the weapon of a policy bankrupt morally, financially, and militarily, a weapon only of ultimate desperation. Its air power of a sort, but as far removed from truly efficient air power, and from the proper purpose of air power, as is a rifle which a soldier, finding his ammunition gone, uses as a club. No one will suggest that a clubbed rifle isn't an extremely dangerous weapon, that its wounds aren't painful. But it is a weapon of bankruptcy.

So today is the rocket cargo carrier. That further development will make it an economic success—both peacetime, and, unfortunately, wartime as well—is undoubtedly true. But the pressure of time—and the Titanic power of three great, smoothly efficient nations—make it impossible for the Nazis to advance it beyond the present stage.

THE EDITOR.

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First Contact

by MURRAY LEINSTER

Illustrated by Orban

***An expedition** from Earth had gone to investigate the Crab Nebula. And—an expedition from Somewhere was already there! Now what is a spaceship skipped to do under such circumstances? Lead the possibly-deadly aliens home? Try to detsroy them? What can he do?*

I.

Tommy Dort went into the captain's room with his last pair of stereophotos and said:

"I'm through, sir. These are the last two pictures I can take."

He handed over the photographs and looked with professional interest at the visiplates which showed all space outside the ship. Subdued, deep-red lighting indicated the controls and such instruments as the quartermaster on duty needed for navigation of the spaceship *Llanvabon*. There was a deeply

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cushioned control chair. There was the little gadget of oddly angled mirrors—remote descendant of the back-view mirrors of twentieth century motorists—which allowed a view of all the visiplates without turning the head. And there were the huge plates which were so much more satisfactory for a direct view of space.

The *Llanvabon* was a long way from home. The plates which showed every star of visual magnitude and could be stepped up to any desired magnification, portrayed stars of every imaginable degree of brilliance, in the startlingly different colors they show outside of atmosphere. But every one was unfamiliar. Only two constellations could be recognized as seen from Earth, and they were shrunken and distorted. The Milky Way seemed vaguely out of place. But even such oddities were minor compared to a sight in the forward plates.

There was a vast, vast mistiness ahead. A luminous mist. It seemed motionless. It took a long time for any appreciable nearing to appear in the vision plates, though the spaceship's velocity indicator showed an incredible speed. The mist was the Crab Nebula, six light-years long, three and a half light-years thick, with outward-reaching members that in the telescopes of Earth gave it some resemblance to the creature for which it was named. It was a cloud of gas, infinitely tenuous, reaching half again as far as from Sol to its nearest neighbor-sun. Deep within it burned two stars; a double star; one component the familiar yellow of the sun of Earth, the other an unholy white.

Tommy Dort said meditatively:

"We're heading into a deep, sir?"

The skipper studied the last two plates of Tommy's taking, and put them aside. He went back to his uneasy contemplation of the vision plates ahead. The *Llanvabon* was decellerating at full force. She was a bare half light-year from the nebula. Tommy's work was guiding the ship's course, now, but the work was done. During all the stay of the exploring ship in the nebula, Tommy Dort would loaf. But he'd more than paid his way so far.

He had just completed a quite unique first—a complete photographic record of the movement of a neubla during a period of four thousand years, taken by one individual with the same apparatus and with control exposures to detect and record any systematic errors. It was an achievement in itself worth the journey from Earth. But in addition, he had also recorded four thousand years of the history of a double star, and four thousand years of the history of a star in the act of degenerating into a white dwarf.

It was not that Tommy Dort was four thousand years old. He was, actually, in his twenties. But the Crab Nebula is four thousand light-years from Earth, and the last two pictures had been taken by light which would not reach Earth until the sixth millennium A. D. On the

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way here—at speeds incredible multiples of the speed of light—Tommy Dort had recorded each aspect of the neubla by the light which had left it from forty centuries since to a bare six months ago.

The *Llanvabon* bored on through space. Slowly, slowly, slowly, the incredible luminosity crept across the vision plates. It blotted out half the universe from view. Before was glowing mist, and behind was a star-studded emptiness. The mist shut off three-fourths of all the stars. Some few of the brightest shone dimly through it near its edge, but only a few. Then there was only an irregularly shaped patch of darkness astern against which stars shone unwinking. The *Llanvabon* dived into the nebula, and it seemed as if it bored into a tunnel of darkness with walls of shining fog.

Which was exactly what the spaceship was doing. The most distant photographs of all had disclosed structural features in the nebula. It was not amorphous. It had form. As the *Llanvabon* drew nearer, indications of structure grew more distinct, and Tommy Dort had argued for a curved approach for photographic reasons. So the spaceship had come up to the nebula on a vast logarithmic curve, and Tommy had been able to take successive photographs from slightly different angles and get stereopairs which showed the nebula in three dimensions; which disclosed billowings and hollows and an actually complicated shape. In places, the nebula displayed convolutions like those of a human brain. It was into one of those hollows that the spaceship now plunged. They had been called "deeps" by analogy with crevasses in the ocean floor. And they promised to be useful.

The skipper relaxed. One of a skipper's functions, nowadays, is to think of things to worry about, and then worry about them. The skipper of the *Llanvabon* was conscientious. Only after a certain instrument remained definitely nonregistering did he ease himself back in his seat.

"It was just barely possible," he said heavily, "that those deeps might be nonluminous gas. But they're empty. So we'll be able to use overdrive as long as we're in them."

It was a light-year-and-a-half from the edge of the nebula to the neighborhood of the double star which was its heart. That was the problem. A nebula is a gas. It is so thin that a comet's tail is solid by comparison, but a ship traveling on overdrive—above the speed of light—does not want to hit even a merely hard vacuum. It needs pure emptiness, such as exists between the stars. But the *Llanvabon* could not do much in this expanse of mist if it was limited to speeds a merely hard vacuum will permit.

The luminosity seemed to close in behind the spaceship, which slowed and slowed and slowed. The overdrive went off with the sudden *pinging* sensation which goes all over a person when the overdrive field is released.

Then, almost instantly, bells burst

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into clanging, strident uproar all through the ship. Tommy was almost deafened by the alarm bell which rang in the captain's room before the quartermaster shut it off with a flip of his hand. But other bells could be heard ringing throughout the rest of the ship, to be cut off as automatic doors closed one by one.

Tommy Dort stared at the skipper. The skipper's hands clenched. He was up and staring over the quartermaster's shoulder. One indicator was apparently having convulsions. Others strained to record their findings. A spot on the diffusedly bright mistiness of a bow-quartering visiplate grew brighter as the automatic scanner focused on it. That was the direction of the object which had sounded collision-alarm. But the object locator itself—. According to its reading, there was one solid object some eighty thousand miles away—an object of no great size. But there was another object whose distance varied from extreme range to zero, and whose size shared its impossible advance and retreat.

"Step up the scanner," snapped the skipper.

The extra-bright spot on the scanner rolled outward, obliterating the undifferentiated image behind it. Magnification increased. But nothing appeared. Absolutely nothing. Yet the radio locator insisted that something monstrous and invisible made lunatic dashes toward the *Llanvabon,* at speeds which inevitably implied collision, and then fled coyly away at the same rate.

The visiplate went up to maximum magnification. Still nothing. The skipper ground his teeth. Tommy Dort said meditatively:

"D'you know, sir, I saw somethink like this on a liner on the Earth-Mars run once, when we were being located by another ship. Their locator beam was the same frequency as ours, and every time it hit, it registered like something monstrous, and solid."

"That," said the skipper savagely, "is just what's happening now. There's something like a locator beam on us. We're getting that beam and our own echo besides. But the other ship's invisible! Who is out here in an invisible ship with locator devices? Not men, certainly!"

He pressed the button in his sleeve communicator and snapped:

"Action stations! Man all weapons! Condition of extreme alert in all departments immediately!"

His hands closed and unclosed. He stared again at the visiplate which showed nothing but a formless brightness.

"Not men?" Tommy Dort straightened sharply. "You mean—"

"How many solar systems in our galaxy?" demanded the skipper bitterly. "How many planets fit for life? And how many kinds of life could there be? If this ship isn't from Earth—and it isn't—it has a crew that isn't human. And things that aren't human but are up to the level of deep-space travel in their civilization could mean anything!"

The skipper's hands were actually shaking. He would not have

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talked so freely before a member of his own crew, but Tommy Dort was of the observation staff. And even a skipper whose duties include worrying may sometimes need desperately to unload his worries. Sometimes, too, it helps to think aloud.

"Something like this has been talked about and speculated about for years," he said softly. "Mathematically, it's been an odds-on bet that somewhere in our galaxy there'd be another race with a civilization equal to or further advanced than ours. Nobody could ever guess where or when we'd meet them. But it looks like we've done it now!"

Tommy's eyes were very bright.

"D'you suppose they'll be friendly, sir?"

The skipper glanced at the distance indicator. The phantom object still made its insane, nonexistent swoops toward and away from the *Llanvabon*. The secondary indication of an object at eighty thousand miles stirred ever so slightly.

"It's moving," he said curtly. "Heading for us. Just what we'd do if a strange spaceship appeared in our hunting grounds! Friendly? Maybe! We're going to try to contact them. We have to. But I suspect this is the end of this expedition. Thank God for the blasters!"

The blasters are those beams of ravening destruction which take care of recalcitrant meteorites in a spaceship's course when the deflectors can't handle them. They are not designed as weapons, but they can serve as pretty good ones. They can go into action at five thousand miles, and draw on the entire power output of a whole ship. With automatic aim and a traverse of five degrees, a ship like the *Llanvabon* can come very close to blasting a hole through a small-sized asteroid which gets in its way. But not on overdrive, of course.

Tommy Dort had approcahed the bow-quartering visiplate. Now he jerked his head around.

"Blaster's sir? What for?"

The skipper grimaced at the empty visiplate.

"Because we don't know what they're like and can't take a chance! I know!" he added bitterly. "We're going to make contacts and try to find out all we can about them—especially where they come from. I suppose we'll try to make friends—, but we haven't much chance. We can't trust them the fraction of an inch. We daren't! They've locators. Maybe they've tracers better than any we have. Maybe they could trace us all the way home without our knowing it! We can't risk a nonhuman race knowing where Earth is unless we're sure of them! And how can we be sure? They could come to trade, of course—or they could swoop down on overdrive with a battle fleet that could wipe us out before we knew what happened. We wouldn't know which to expect, or when!"

Tommy's face was startled.

"It's all been thrashed out over and over, in theory," said the skipper. "Nobody's ever been able to find a sound answer, even on paper.

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But you know, in all their theorizing, no one considered the crazy, rank impossibility of a deep-space contact, with neither side knowing the other's home world! But we've got to find an answer in fact! What are we going to do about them? Maybe these creatures will be aesthetic marvels, nice and friendly and polite—and underneath with the sneaking brutal ferocity of a Japanese. Or maybe they'll be crude and gruff as a Swedish farmer—and just as decent underneath. Maybe they're something in between. But am I going to risk the possible future of the human race on a guess that it's safe to trust them? God knows it would be worth while to make friends with a new civilization! It would be bound to stimulate our own, and maybe we'd gain enormously. But I can't take chances. The one thing I won't risk is having them know how to find Earth! Either I know they can't follow me, or I don't go home! And they'll probably feel the same way!"

He pressed the sleeve-communicator button again.

"Navigation officers, attention! Every star map on this ship is to be prepared for instant destruction. This includes photographs and diagrams from which our course or starting point could be deduced. I want all astronomical data gathered and arranged to be destroyed in a split second, on order. Make it fast and report when ready!"

He released the button. He looked suddenly old. The first contact of humanity with an alien race was a situation which had been foreseen in many fashions, but never one quite so hopeless of solution as this. A solitary Earth-ship and a solitary alien, meeting in a nebula which must be remote from the home planet of each. They might wish peace, but the line of conduct which best prepared a treacherous attack was just the seeming of friendliness. Failure to be suspicious might doom the human race,—and a peaceful exchange of the fruits of civilization would be the greatest benefit imaginable. Any mistake would be irreparable, but a failure to be on guard would be fatal.

The captain's room was very, very quiet. The bow-quartering visiplate was filled with the image of a very small section of the nebula. A very small section indeed. It was all diffused, featureless, luminous mist. But suddenly Tommy Dort pointed.

"There, sir!"

There was a small shape in the mist. It was far away. It was a black shape, not polished to mirror-reflection like the hull of the *Llanvabon*. It was bulbous—roughly pear-shaped. There was much thin luminosity between, and no details could be observed, but it was surely no natural object. Then Tommy looked at the distance indicator and said quietly:

"It's headed for us at very high accelleration, sir. The odds are that they're thinking the same thing, sir, that neither of us will dare let the other go home. Do you think they'll try a contact with us, or let loose with their weapons as soon as they're in range?"

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The *Llanvabon* was no longer in a crevasse of emptiness in the nebulas' thin substance. She swam in luminescence. There were no stars save the two fierce glows in the nebula's heart. There was nothing but an all-enveloping light, curiously like one's imagining of underwater in the tropics of Earth.

The alien ship had made one sign of less than lethal intention. As it drew near the *Llanvabon,* it decelerated. The *Llanvabon* itself had advanced for a meeting and then come to a dead stop. Its movement had been a recognition of the nearness of the other ship. Its pausing was both a friendly sign and a precaution against attack. Relatively still, it could swivel on its own axis to present the least target to a slashing assault, and it would have a longer firing-time than if the two ships flashed past each other at their combined speeds.

The moment of actual approach, however, was tenseness itself. The *Llanvabon's* needle-pointed bow aimed unwaveringly at the alien bulk. A relay to the captain's room put a key under his hand which would fire the blasters with maximum power. Tommy Dort watched, his brow wrinkled. The aliens must be of a high degree of civilization if they had spaceships, and civilization does not develop without the development of foresight. These aliens must recognize all the implications of this first contact of two civilized races as fully as did the humans on the *Llanvabon.*

The possibility of an enormous spurt in the development of both, by peaceful contact and exchange of their separate technologies, would probably appeal to them as to the man. But when dissimilar human cultures are in contact, one must usually be subordinate or there is war. But subordination between races arising on separate planets could not be peacefully arranged. Men, at least, would never consent to subordination, nor was it likely that any highly-developed race would agree. The benefits to be derived from commerce could never make up for a condition of inferiority. Some races—men, perhaps—would prefer commerce to conquest. Perhaps — perhaps! — these aliens would also. But some types even of human beings would have craved red war. If the alien ship now approaching the *Llanvabon* returned to its home base with news of humanity's existence and of ships like the *Llanvabon,* it would give its race the choice of trade or battle. They might want trade, or they might want war. But it takes two to make trade, and only one to make war. They could not be sure of men's peacefulness, nor could men be sure of theirs. The only safety for either civilization would lie in the destruction of one or both of the two ships here and now.

But even victory would not be really enough. Men would need to know where this alien race was to be found, for avoidance if not for battle. They would need to know its weapons, and its resources, and if it could be a menace and how it could be eliminated in case of need. The aliens would feel the same

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necessities concerning humanity.

So the skipper of the *Llanvabon* did not press the key which might possibly have blasted the other ship to nothingness. He dared not. But he dared not not fire either. Sweat came out on his face.

A speaker muttered. Someone from the range room.

"The other ship's stopped, sir. Quite stationary. Blasters are centered on it, sir."

It was an urging to fire. But the skipper shook his head, to himself. The alien ship was no more than twenty miles away. It was dead-black. Every bit of its exterior was an abysmal, nonreflecting sable. No details could be seen except by minor variations in its outline against the misty nebula.

"It's stopped dead sir," said another voice. "They've sent a modulated short wave at us, sir. Frequency modulated. Apparently a signal. Not enough power to do any harm."

The skipper said through tight-locked teeth:

"They're doing something now. There's movement on the outside of their hull. Watch what comes out. Put the auxiliary blasters on it."

Something small and round came smoothly out of the oval outline of the black ship. The bulbous hulk moved.

"Moving away, sir," said the speaker. "The object they let out is stationary in the place they've left."

Another voice cut in:

"More frequency modulated stuff,

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sir. Unintelligible."

Tommy Dort's eyes brightened. The skipper watched the visiplate, with sweat-droplets on his forehead.

"Rather pretty, sir," said Tommy, meditatively. "If they sent anything toward us, it might seem a projectile or a bomb. So they came close, let out a lifeboat, and went away again. They figure we can send a boat or a man to make contact without risking our ship. They must think pretty much as we do."

The skipper said, without moving his eyes from the plate:

"Mr. Dort, would you care to go out and look the thing over? I can't order you, but I need all my operating crew for emergencies. The observation staff—"

"Is expendable. Very well, sir," said Tommy briskly. "I won't take a lifeboat, sir. Just a suit with a drive in it. It's smaller and the arms and legs will look unsuitable for a bomb. I think I should carry a scanner, sir."

The alien ship continued to retreat. Forty, eighty, four hundred miles. It came to a stop and hung there, waiting. Climbing into his atomic-driven spacesuit just within the *Llanvabon's* air lock, Tommy heard the reports as they went over the speakers throughout the ship. That the other ship had stopped its retreat at four hundred miles was encouraging. It might not have weapons effective at a greater distance than that, and so felt safe. But just as the thought formed itself in his mind, the alien retreated precipitately still farther. Which, as Tommy reflected as he emerged from the lock, might be because the aliens had realized they were giving themselves away, or might be because they wanted to give the impression that they had done so.

He swooped away from the silvery-mirror *Llanvabon*, through a brightly glowing emptiness which was past any previous experience of the human race. Behind him, the *Llanvabon* swung about and darted away. The skipper's voice came in Tommy's helmet phones.

"We're pulling back, too, Mr. Dort. There is a bare possibility that they've some explosive atomic reaction they can't use from their own ship, but which might be destructive even as far as this. We'll draw back. Keep your scanner on the object."

The reasoning was sound, if not very comforting. An explosive which would destroy anything within twenty miles was theoretically possible, but humans didn't have it yet. It was decidedly safest for the *Llanvabon* to draw back.

But Tommy Dort felt very lonely. He sped through emptiness toward the tiny black speck which hung in incredible brightness. The *Llanvabon* vanished. Its polished hull would merge with the glowing mist at a relatively short distance, anyhow. The alien ship was not visible to the naked eye, either. Tommy swam in nothingness, four thousand light-years from home, toward a tiny black spot which was the only solid object to be seen in all of space.

It was a slightly distorted sphere, not much over six feet in diameter.

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It bounced away when Tommy landed on it, feet-first. There were small tentacles, or horns, which projected in every direction. They looked rather like the detonating horns of a submarine mine, but there was a glint of crystal at the tip-end of each.

"I'm here," said Tommy into his helmet phone.

He caught hold of a horn and drew himself to the object. It was all metal, dead-black. He could feel no texture through his space gloves, of course, but he went over and over it, trying to discover its purpose.

"Deadlock, sir," he said presently. "Nothing to report that the scanner hasn't shown you."

Then, through his suit, he felt vibrations. They translated themselves as clankings. A section of the rounded hull of the object opened out. Two sections. He worked his way around to look in and see the first nonhuman civilized beings that any man had ever looked upon.

But what he saw was simply a flat plate on which dim-red glows crawled here and there in seeming aimlessness. His helmet phones emitted a startled exclamation. The skipper's voice:

"Very good, Mr. Dort. Fix your scanner to look into that plate. They dumped out a robot with an infrared visiplate for communication. Not risking any personnel. Whatever we might do would damage only machinery. Maybe they expect us to bring it on board—and it may have a bomb charge that can be detonated when they're ready to start for home. I'll send a plate to face one of its scanners. You return to the ship."

"Yes, sir," said Tommy. "But which way is the ship, sir?"

There were no stars. The nebula obscured them with its light. The only thing visible from the robot was the double star at the nebula's center. Tommy was no longer oriented. He had but one reference point.

"Head straight away from the double star," came the order in his helmet phone. "We'll pick you up."

He passed another lonely figure, a little later, headed for the alien sphere with a vision plate to set up. The two spaceships, each knowing that it dared not risk its own race by the slightest lack of caution, would communicate with each other through this small round robot. Their separate vision systems would enable them to exchange all the information they dared give, while they debated the most practical way of making sure that their own civilization would not be endangered by this first contact with another. The truly most practical method would be the destruction of the other ship in a swift and deadly attack—in self-defense.

III.

The *Llanvabon*, thereafter, was a ship in which there were two separate enterprises on hand at the same time. She had come out from Earth to make close-range observations on the smaller component of the double

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star at the nebula's center. The nebula itself was the result of the most titanic explosion of which men have any knowledge. The explosion took place some time in the year 2946 B. C., before the first of the seven cities of long-dead Illium was even thought of. The light of that explosion reached Earth in the year 1054 A. D., and was duly recorded in ecclesiastic annals and somewhat more reliably by Chinese court astronomers. It was bright enough to be seen in daylight for twenty-three successive days. Its light—and it was four thousand light-years away—was brighter than that of Venus.

From these facts, astronomers could calculate nine hundred years later the violence of the detonation. Matter blown away from the center of the exposion would have traveled outward at the rate of two million three hundred thousand miles an hour; more than thirty-eight thousand miles a minute; something over six hundred thirty-eight miles per second. When twentieth-century telescopes were turned upon the scene of this vast explosion, only a double star remained—and the nebula. The brighter star of the doublet was almost unique in having so high a surface temperature that it showed no spectrum lines at all. It had a continuous spectrum. Sol's surface temperature is about 7,000° Absolute. That of the hot white star is 500,000 degrees. It has nearly the mass of the sun, but only one fifth its diameter, so that its density is one hundred seventy-three times that of water, sixteen times that of lead, and eight times that of iridium—the heaviest substance known on earth. But even this density is not that of a dwarf white star like the companion of Sirius. The white star in the Crab Nebula *is an incomplete dwarf; it is a star* still in the act of collapsing. Examination—including the survey of a four-thousand-year column of its light—was worth while. The *Llanvabon* had come to make that examination. But the finding of an alien spaceship upon a similar errand had implications which overshadowed the original purpose of the expedition.

A tiny bulbous robot floated in the tenuous nebular gas. The normal operating crew of the *Llanvabon* stood at their posts with a sharp alertness which was productive of tense nerves. The observation staff divided itself, and a part went half-heartedly about the making of the observations for which the *Llanvabon* had come. The other half applied itself to the problem the spaceship offered.

It represented a culture which was up to space travel on an interstellar scale. The explosion of a mere five thousand years since must have blasted every trace of life out of existence in the area now filled by the nebula. So the aliens of the black spaceship came from another solar system. Their trip must have been, like that of the Earth ship, for purely scientific purposes. There was nothing to be extracted from the nebula.

They were, then, at least near the level of human civilization, which meant that they had or could

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develop arts and articles of commerce which men would want to trade for, in friendship. But they would necessarily realize that the existence and civilization of humanity was a potential menace to their own race. The two races could be friends, but also they could be deadly enemies. Each, even if unwillingly, was a monstrous menace to the other. And the only safe thing to do with a menace is to destroy it.

In the Crab Nebula the problem was acute and immediate. The future relationship of the two races would be settled here and now. If a process for friendship could be established, one race, otherwise doomed, would survive and both would benefit immensely. But that process had to be established, and confidence built up, without the most minute risk of danger from treachery. Confidence would need to be established upon a foundation of necessarily complete distrust. Neither dared return to its own base if the other could do harm to its race. Neither dared risk any of the necessities to trust. The only safe thing for either to do was destroy the other or be destroyed.

But even for war, more was needed than mere destruction of the other. With interstellar traffic, the aliens must have atomic power and some form of overdrive for travel above the speed of light. With radio location and visiplates and short-wave communication they had, of course, many other devices. What weapons did they have? How widely extended was their culture? What were their resources? Could there be a development of trade and friendship, or were the two races so unlike that only war could exist between them? If peace was possible, how could it be begun?

The men on the *Llanvabon* needed facts—and so did the crew of the other ship. They must take back every morsel of information they could. The most important information of all would be of the location of the other civilization, just in case of war. That one bit of information might be the decisive factor in an interstellar war. But other facts would be enormously valuable.

The tragic thing was that there could be no possible information which could lead to peace. Neither ship could stake its own race's existence upon any conviction of the good will or the honor of the other.

So there was a strange truce between the two ships. The alien went about its work of making observations, as did the *Llanvabon*. The tiny robot floated in bright emptiness. A scanner from the *Llanvabon* was focussed upon a vision plate from the alien. A scanner from the alien regarded a vision plate from the *Llanvabon*. Communication began.

It progressed rapidly. Tommy Dort was one of those who made the first progress report. His special task on the expedition was over. He had now been assigned to work on the problem of communication with the alien entities. He went with the ship's solitary psychologist to the captain's room to convey the

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news of success. The captain's room, as usual, was a place of silence and dull-red indicator lights and the great bright visiplates on every wall and on the ceiling.

"We've established fairly satisfactory communication, sir," said the psychologist. He looked tired. His work on the trip was supposed to be that of measuring personal factors of error in the observation staff, for the reduction of all observations to the nearest possible decimal to the absolute. He had been pressed into service for which he was not especially fitted, and it told upon him. "That is, we can say almost anything we wish, to them, and can understand what they say in return. But of course we don't know how much of what they say is the truth."

The skipper's eyes turned to Tommy Dort.

"We've hooked up some machinery," said Tommy, "that amounts to a mechanical translator. We have vision plates, of course, and then short-wave beams direct. They use frequency-modulation plus what is probably variation in wave forms—like our vowel and consonant sounds in speech. We've never had any use for anything like that before, so our coils won't handle it, but we've developed a sort of code which isn't the language of either set of us. They shoot over short-wave stuff with frequency-modulation, and we record it as sound. When we shoot it back, it's reconverted into frequency-modulation."

The skipper said, frowning:

"Why wave-form changes in short waves? How do you know?"

"We showed them our recorder in the vision plates, and they showed us theirs. They record the frequency-modulation direct. I think," said Tommy carefully, "they don't use sound at all, even in speech. They've set up a communications room, and we've watched them in the act of communicating with us. They make no perceptible movement of anything that corresponds to a speech organ. Instead of a microphone, they simply stand near something that would work as a pick-up antenna. My guess, sir, is that they use microwaves for what you might call person-to-person conversation. I think they make short-wave trains as we make sounds."

The skipper stared at him:

"That means they have telepathy?"

"M-m-m. Yes, sir," said Tommy. "Also it means that we have telepathy too, as far as they are concerned. They're probably deaf. They've certainly no idea of using sound waves in air for communication. They simply don't use noises for any purpose."

The skipper stored the information away.

"What else?"

"Well, sir," said Tommy doubtfully, "I think we're all set. We agreed on arbitrary symbols for objects, sir, by way of the visiplates, and worked out relationships and verbs and so on with diagrams and pictures. We've a couple of thousand words that have mutual meanings. We set up an analyzer to sort

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out their short-wave groups, which we feed into a decoding machine. And then the coding end of the machine picks out recordings to make the wave groups we want to send back. When you're ready to talk to the skipper of the other ship, sir, I think we're ready."

"H-m-m. What's your impression of their psychology?" The skipper asked the question of the psychologist.

"I don't know, sir," said the psychologist harassedly. "They seem to be completely direct. But they haven't let slip even a hint of the tenseness we know exists. They act as if they were simply setting up a means of communication for friendly conversation. But there is . . . well . . . an overtone—"

The psychologist was a good man at psychological mensuration, which is a good and useful field. But he was not equipped to analyze a completely alien thought-pattern.

"If I may say so, sir—" said Tommy uncomfortably.

"What?"

"They're oxygen breathers," said Tommy, "and they're not too dissimilar to us in other ways. It seems to me, sir, that paralled evolution has been at work. Perhaps intelligence evolves in parallel lines, just as . . . well . . . basic bodily functions. I mean," he added conscientiously, "any living being of any sort must ingest, metabolize, and excrete. Perhaps any intelligent brain must perceive, apperceive, and find a personal reaction. I'm sure I've detected irony. That implies humor, too. In short, sir, I think they could be likable."

The skipper heaved himself to his feet.

"H-m-m." He said profoundly. "We'll see what they have to say."

He walked to the communications room. The scanner for the vision plate in the robot was in readiness. The skipper walked in front of it. Tommy Dort sat down at the coding machine and tapped at the keys. Highly improbable noises came from it, went into a microphone, and governed the frequency-modulation of a signal sent through space to the other spaceship. Almost instantly the vision screen which with one relay—in the robot—showed the interior of the other ship lighted up. An alien came before the scanner and seemed to look inquisitively out of the plate. He was extraordinarily manlike, but he was not human. The impression he gave was of extreme baldness and a somehow humorous frankness.

"I'd like to say," said the skipper heavily, "the appropriate things about this first contact of two dissimilar civilized races, and of my hopes that a friendly intercourse between the two peoples will result."

Tommy Dort hesitated. Then he shrugged and tapped expertly upon the coder. More improbable noises.

The alien skipper seemed to receive the message. He made a gesture which was wryly assenting. The decoder on the *Llanvabon* hummed to itself and word-cards dropped into the message frame. Tommy said dispassionately:

"He says, sir, 'That is all very

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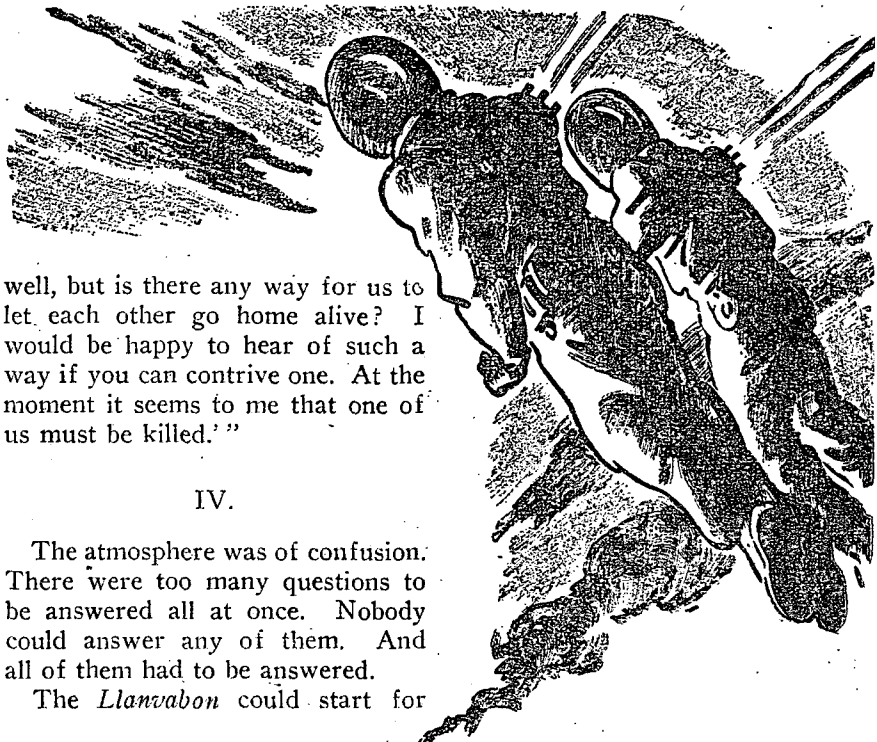

well, but is there any way for us to let each other go home alive? I would be happy to hear of such a way if you can contrive one. At the moment it seems to me that one of us must be killed.' "

IV.

The atmosphere was of confusion. There were too many questions to be answered all at once. Nobody could answer any of them. And all of them had to be answered.

The *Llanvabon* could start for home. The alien ship might or might not be able to multiply the speed of light by one more unit than the Earth vessel. If it could, the *Llanvabon* would get close enough to Earth to reveal its destination—and then have to fight. It might or might not win. Even if it did win, the aliens might have a communication system by which the *Llanvabon's* destination might have been reported to the aliens' home planet before battle was joined. But the *Llanvabon* might lose in such a fight. If she was to be destroyed, it would be better to be destroyed here, without giving any clue to where human

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beings might be found by a forewarned, forearmed alien battle fleet.

The black ship was in exactly the same predicament. It too, could start for home. But the *Llanvabon* might be faster, and an overdrive field can be trailed, if you set to work on it soon enough. The aliens, also, would not know whether the *Llanvabon* could report to its home base without returning. If the alien was to be destroyed, it also would prefer to fight it out here, so that it could not lead a probable enemy to its own civilization.

Neither ship, then, could think of flight. The course of the *Llanvabon* into the nebula might be known to the black ship, but it had been the end of a logarithmic curve, and the aliens could not know its properties. They could not tell from that from what direction the Earth ship had started. As of the moment, then, the two ships were even. But the question was and remained, "What now?"

There was no specific answer. The aliens traded information for information—and did not always realize what information they gave. The humans traded information for information—and Tommy Dort sweated blood in his anxiety not to give any clue to the whereabouts of Earth.

The aliens saw by infrared light, and the vision plates and scanners in the robot communication-exchange had to adapt their respective images up and down an optical octave each, for them to have any meaning at all. It did not occur to the aliens that their eyesight told that their sun was a red dwarf, yielding light of greatest energy just below the part of the spectrum visible to human eyes. But after that fact was realized on the *Llanvabon*, it was realized that the aliens, also, should be able to deduce the Sun's spectral type by the light to which men's eyes were best adapted.

There was a gadget for the recording of short-wave trains which was so casually in use among the aliens as a sound-recorder is among men. The humans wanted that, badly. And the aliens were fascinated by the mystery of sound. They were able to perceive noise, of course, just as a man's palm will perceive infrared light by the sensation of heat it produces, but they could no more differentiate pitch or tone-quality than a man is able to distinguish between two frequencies of heat-radiation even half an octave part. To them, the human science of sound was a remarkable discovery. They would find uses for noises which humans had never imagined—if they lived.

But that was another question. Neither ship could leave without first destroying the other. But while the flood of information was in passage, neither ship could afford to destroy the other. There was the matter of the outer coloring of the two ships. The *Llanvabon* was mirror-bright exteriorly. The alien ship was dead-black by visible light. It absorbed heat to perfection, and should radiate it away again as readily. But it did not. The black coating was not a "black body" color

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or lack of color. It was a perfect reflector of certain infrared wave lengths while simultaneously it fluoresced in just those wave bands. In practice, it absorbed the higher frequencies of heat, converted them to lower frequencies it did not radiate—and stayed at the desired temperature even in empty space.

Tommy Dort labored over his task of communications. He found the alien thought-processes not so alien that he could not follow them. The discussion of technics reached the matter of interstellar navigation. A star map was needed to illustrate the process. It would not have been logical to use a star map from the chart room—but from a star map one could guess the point from which the map was projected. Tommy had a map made specially, with imaginary but convincing star images upon it. He translated directions for its use by the coder and decoder. In return, the aliens presented a star map of their own before the visiplate. Copied instantly by photograph, the Nav officers labored over it, trying to figure out from what spot in the galaxy the stars and Milky Way would show at such an angle. It baffled them.

It was Tommy who realized finally that the aliens had made a special star map for their demonstration too, and that it was a mirror-image of the faked map Tommy had shown them previously.

Tommy could grin, at that. He began to like these aliens. They were not human, but they had a very human sense of the ridiculous. In course of time Tommy essayed a mild joke. It had to be translated into code numerals, these into quite cryptic groups of short-wave, frequency-modulated impulses, and these went to the other ship and into heaven knew what to become intelligible. A joke which went through such formalities would not seem likely to be funny. But the aliens did see the point.

There was one of the aliens to whom communication became as normal a function as Tommy's own code-handlings. The two of them developed a quite insane friendship, conversing by coder, decoder, and short-wave trains. When technicalities in the official messages grew too involved, that alien sometimes threw in strictly nontechnical interpolations akin to slang. Often, they cleared up the confusion. Tommy, for no reason whatever, had filed a code-name of "Buck" which the decoder picked out regularly when this particular signed his own symbol to a message.

In the third week of communication, the decoder suddenly presented Tommy with a message in the message frame.

You are a good guy. It is too bad we have to kill each other.—Buck.

Tommy had been thinking much the same thing. He tapped off the rueful reply;

We can't see any way out of it. Can you?

There was a pause, and the message frame filled up again.

If we could believe each other, yes. Our skipper would like it. But we can't

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believe you, and you can't believe us. We'd trail you home if we got a chance, and you'd trail us. But we feel sorry about it.—Buck.

Tommy Dort took the messages to the skipper.

"Look here, sir!" he said urgently. "These people are almost human, and they're likable cusses."

The skipper was busy about his important task of thinking things to worry about, and worrying about them. He said tiredly:

"They're oxygen breathers. Their air is twenty-eight percent oxygen instead of twenty, but they could do very well on Earth. It would be a highly desirable conquest for them. And we still don't know what weapons they've got or what they can develop. Would you tell them how to find Earth?"

"N-no," said Tommy, unhappily.

"They probably feel the same way," said the skipper dryly. "And if we did manage to make a friendly contact, how long would it stay friendly? If their weapons were inferior to ours, they'd feel that for their own safety they had to improve them. And we, knowing they were planning to revolt, would crush them while we could—for our own safety! If it happened to be the other way about, they'd have to smash us before we could catch up to them."

Tommy was silent, but he moved restlessly.

"If we smash this black ship and get home," said the skipper, "Earth Government will be annoyed if we don't tell them where it came from. But what can we do? We'll be lucky enough to get back alive with our warning. It isn't possible to get out of those creatures any more information than we give them, and we surely won't give them our address! We've run into them by accident. Maybe—if we smash this ship—there won't be another contact for thousands of years. And it's a pity, because trade could mean so much! But it takes two to make a peace, and we can't risk trusting them. The only answer is to kill them if we can, and if we can't, to make sure that when they kill us they'll find out nothing that will lead them to Earth. I don't like it," added the skipper tiredly, "but there simply isn't anything else to do!"

V.

On the *Llanvabon*, the technicians worked frantically in two divisions. One prepared for victory, and the other for defeat. The ones working for victory could do little. The main blasters were the only weapons with any promise. Their mountings were cautiously altered so that they were no longer fixed nearly dead ahead, with only a 5° traverse. Electronic controls which followed a radio-locator master-finder would keep them trained with absolute precision upon a given target regardless of its maneuverings. More; a hitherto unsung genius in the engine room devised a capacity-storage system by which the normal full-output of the ship's engines could be momentarily accumulated and released in surges of stored power far above normal. In theory,

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the range of the blasters should be multiplied and their destructive power considerably stepped up. But there was not much more that could be done.

The defeat crew had more leeway. Star charts, navigational instruments carrying telltale notations, the photographic record Tommy Dort had made on the six-months' journey from Earth, and every other memorandum offering clues to Earth's position, were prepared for destruction. They were put in sealed files, and if any one of them was opened by one who did not know the exact, complicated process, the contents of all the files would flash into ashes and the ash be churned past any hope of restoration. Of course, if the *Llanvabon* should be victorious, a carefully not-indicated method of reopening them in safety would remain.

There were atomic bombs placed all over the hull of the ship. If its human crew should be killed without complete destruction of the ship, the atomic-power bombs should detonate if the *Llanvabon* was brought alongside the alien vessel. There were no ready-made atomic bombs on board, but there were small spare atomic-power units on board. It was not hard to trick them so that when they were turned on, instead of yielding a smooth flow of power they would explode. And four men of the earth ship's crew remained always in spacesuits with closed helmets, to fight the ship should it be punctured in many compartments by an unwarned attack.

Such an attack, however, would not be treacherous. The alien skipper had spoken frankly. His manner was that of one who wryly admits the uselessness of lies. The skipper and the *Llanvabon,* in turn, heavily admitted the virtue of frankness. Each insisted—perhaps truthfully—that he wished for friendship between the two races. But neither could trust the other not to make every conceivable effort to find out the one thing he needed most desperately to conceal—the location of his home planet. And neither dared believe that the other was unable to trail him and find out. Because each felt it his own duty to accomplish that unbearable—to the other—act, neither could risk the possible existence of his race by trusting the other. They must fight because they could not do anything else.

They could raise the stakes of the battle by an exchange of information beforehand. But there was a limit to the stake either would put up. No information on weapons, population, or resources would be given by either. Not even the distance of their home bases from the Crab Nebula would be told. They exchanged information, to be sure, but they knew a battle to the death must follow, and each strove to represent his own civilization as powerful enough to give pause to the other's ideas of possible conquest—and thereby increased its appearance of menace to the other, and made battle more unavoidable.

It was curious how completely such alien brains could mesh, how-

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ever. Tommy Dort, sweating over the coding and decoding machines, found a personal equation emerging from the at first stilted arrays of word-cards which arranged themselves. He had seen the aliens only in the vision screen, and then only in light at least one octave removed from the light they saw by. They, in turn, saw him very strangely, by transposed illumination from what to them would be the far ultraviolet. But their brains worked alike. Amazingly alike. Tommy Dort felt an actual sympathy and even something close to friendship for the gill-breathing, bald, and dryly ironic creatures of the black space vessel.

Because of that mental kinship he set up—though hopelessly—a sort of table of the aspects of the problem before them. He did not believe that the aliens had any instinctive desire to destroy man. In fact, the study of communications from the aliens had produced on the *Llanvabon* a feeling of tolerance not unlike that between enemy soldiers during a truce on Earth. The men felt no enmity, and probably neither did the aliens. But they had to kill or be killed for strictly logical reasons.

Tommy's table was specific. He made a list of objectives the men must try to achieve, in the order of their importance. The first was the carrying back of news of the existence of the alien culture. The second was the location of that alien culture in the galaxy. The third was the carrying back of as much information as possible about that culture. The third was being worked on, but the second was probably impossible. The first—and all—would depend on the result of the fight which must take place.

The aliens' objectives would be exactly similar, so that the men must prevent, first, news of the existence of Earth's culture from being taken back by the aliens, second, alien discovery of the location of Earth, and third, the acquiring by the aliens of information which would help them or encourage them to attack humanity. And again the third was in train, and the second was probably taken care of, and the first must await the battle.

There was no possible way to avoid the grim necessity of the destruction of the black ship. The aliens would see no solution to their problems but the destruction of the *Llanvabon*. But Tommy Dort, regarding his tabulation ruefully, realized that even complete victory would not be a perfect solution. The ideal would be for the *Llanvabon* to take back the alien ship for study. Nothing less would be a complete attainment of the third objective. But Tommy realized that he hated the idea of so complete a victory, even if it could be accomplished. He would hate the idea of killing even nonhuman creatures who understood a human joke. And beyond that, he would hate the idea of Earth fitting out a fleet of fighting ships to destroy an alien culture because its existence was dangerous. The pure accident of this encounter, between peoples who could like each other, had created a situation which could

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only result in wholesale destruction.

Tommy Dort soured on his own brain which could find no answer which would work. But there had to be an answer! The gamble was too big! It was too absurd that two spaceships should fight—neither one primarily designed for fighting—so that the survivor could carry back news which would set one case to frenzied preparation for war against the unwarned other.

If both races could be warned, though, and each knew that the other did not want to fight, and if they could communicate with each other but not locate each other until some grounds for mutual trust could be reached—

It was impossible. It was chimerical. It was a daydream. It was nonsense. But it was such luring nonsense that Tommy Dort ruefully put it into the coder to his gill-breathing friend Buck, then some hundred thousand miles off in the misty brightness of the nebula.

"Sure," said Buck, in the decoder's word-cards flicking into place in the message frame. "That is a good dream. But I like you and still won't believe you. If I said that first, you would like me but not believe me either. I tell you the truth more than you believe, and maybe you tell me the truth more than I believe. But there is no way to know. I am sorry."

Tommy Dort stared gloomily at the message. He felt a very horrible sense of responsibility. Everyone did, on the *Llanvabon*. If they failed in this encounter, the human race would run a very good chance of being exterminated in time to come. If they succeeded, the race of the aliens would be the one to face destruction, most likely. Millions or billions of lives hung upon the actions of a few men.

Then Tommy Dort saw the answer.

It would be amazingly simple, if it worked. At worst it might give a partial victory to humanity and the *Llanvabon*. He sat quite still, not daring to move lest he break the chain of thought that followed the first tenuous idea. He went over and over it, excitedly finding objections here and meeting them, and overcoming impossibilities there. It was the answer! He felt sure of it.

He felt almost dizzy with relief when he found his way to the captain's room and asked leave to speak.

It is the function of a skipper, among others, to find things to worry about. But the *Llanvabon's* skipper did not have to look. In the three weeks and four days since the first contact with the alien black ship, the skipper's face had grown lined and old. He had not only the *Llanvabon* to worry about. He had all of humanity.

"Sir," said Tommy Dort, his mouth rather dry because of his enormous earnestness, "may I offer a method of attack on the black ship? I'll undertake it myself, sir, and if it doesn't work our ship won't be weakened."

The skipper looked at him unseeingly.

"The tactics are all worked out.

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Mr. Dort," he said heavily. "They're being cut on tape now, for the ship's handling. It's a terrible gamble, but it has to be done."

"I think," said Tommy carefully, "I've worked out a way to take the gamble out. Suppose, sir, we send a message to the other ship, offering—"

His voice went on in the utterly quiet captain's room, with the visiplates showing only a vast mistiness outside and the two fiercely burning stars in the nebula's heart.

VI.

The skipper himself went through the air lock with Tommy. For one reason, the action Tommy had suggested would need his authority behind it. For another, the skipper had worried more intensively than anybody else on the *Llanvabon,* and he was tired of it. If he went with Tommy, he would do the thing himself, and if he failed he would be the first one killed—and the taps for the Earth ship's maneuvering was already fed into the control board and correlated with the master-timer. If Tommy and the skipper were killed, a single control pushed home would throw the *Llanvabon* into the most furious possible all-out attack, which would end in the complete destruction of one ship or the other—or both. So the skipper was not deserting his post.

The outer air lock door swung wide. It opened upon that shining emptiness which was the nebula. Twenty miles away, the little round robot hung in space, drifting in an incredible orbit about the twin central suns, and floating ever nearer and nearer. It would never reach either of them, of course. The white star alone was so much hotter than Earth's sun that its heat-effect would produce Earth's temperature on an object five times as far from it as Neptune is from Sol. Even removed to the distance of Pluto, the little robot would be raised to cherry-red heat by the blazing white dwarf. And it could not possibly approach to the ninety-odd million miles which is the Earth's distance from the sun. So near, its metal would melt and boil away as vapor. But, half a light-year out, the bulbous object bobbed in emptiness.

The two spacesuited figures soared away from the *Llanvabon.* The small atomic drives which made them minute spaceships on their own had been subtly altered, but the change did not interfere with their functioning. They headed for the communication robot. The skipper, out in space, said gruffly:

"Mr. Dort, all my life I have longed for adventure. This is the first time I could ever justify it to myself."

His voice came through Tommy's space-phone receivers. Tommy wetted his lips and said:

"It doesn't seem like adventure to me, sir. I want terribly for the plan to go through. I thought adventure was when you didn't care."

"Oh, no," said the skipper. "Adventure is when you toss your life on the scales of chance and wait for the pointer to stop."

They reached the round object.

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They clung to its short, scanner-tipped horns.

"Intelligent, those creatures," said the skipper heavily. "They must want desperately to see more of our ship than the communications room, to agree to this exchange of visits before the fight."

"Yes, sir," said Tommy. But privately, he suspected that Buck—his gill-breathing friend—would like to see him in the flesh before one or both of them died. And it seemed to him that between the two ships had grown up an odd tradition of courtesy, like that between two ancient knights before a tourney, when they admired each other wholeheartedly before hacking at each other with all the contents of their respective armories.

They waited.

Then, out of the mist, came two other figures. The alien spacesuits were also power-driven. The aliens themselves were shorter than men, and their helmet openings were coated with a filtering material to cut off visible and ultraviolet rays which to them would be lethal. It was not possible to see more than the outline of the heads within.

Tommy's helmet phone said, from the communications room on the *Llanvabon:*

"They say that their ship is waiting for you, sir. The airlock door will be open."

The skipper's voice said heavily:

"Mr. Dort, have you seen their spacesuits before? If so, are you sure they're not carrying anything extra, such as bombs?"

"Yes, sir," said Tommy. "We've showed each other our space equipment. They've nothing but regular stuff in view, sir."

The skipper made a gesture to the two aliens. He and Tommy Dort plunged on for the black vessel. They could not make out the ship very clearly with the naked eye, but directions for change of course came from the communication room.

The black ship loomed up. It was huge; as long as the *Llanvabon* and vastly thicker. The air lock did stand open. The two spacesuited men moved in and anchored themselves with magnetic-soled boots. The outer door closed. There was a rush of air and simultaneously the sharp quick tug of artificial gravity. Then the inner door opened.

All was darkness. Tommy switched on his helmet light at the same instant as the skipper. Since the aliens saw by infrared, a white light would have been intolerable to them. The man's helmet lights were, therefore, of the deep-red tint used to illuminate instrument panels so there will be no dazzling of eyes that must be able to detect the minutest specks of white light on a navigating vision plate. There were aliens waiting to receive them. They blinked at the brightness of the helmet lights. The space-phone receivers said in Tommy's ear:

"They say, sir, their skipper is waiting for you."

Tommy and the skipper were in a long corridor with a soft flooring underfoot. Their lights showed

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details of which every one was exotic.

"I think I'll crack my helmet, sir," said Tommy.

He did. The air was good. By analysis it was thirty percent oxygen instead of twenty for normal air on Earth, but the pressure was less. It felt just right. The artificial gravity, too, was less than that maintained on the *Llanvabon*. The home planet of the aliens would be smaller than Earth, and —by the infrared data—circling close to a nearly dead, dull-red sun. The air had smells in it. They were utterly strange, but not unpleasant.

An arched opening. A ramp with the same soft stuff underfoot. Lights which actually shed a dim, dull-red glow about. The aliens had stepped up some of their illuminating equipment as an act of courtesy. The light might hurt their eyes, but it was a gesture of consideration which made Tommy even more anxious for his plan to go through.

The alien skipper faced them, with what seemed to Tommy a gesture of wryly humorous deprecation. The helmet phones said:

"He says, sir, that he greets you with pleasure, but he has been able to think of only one way in which the problem created by the meeting of these two ships can be solved."

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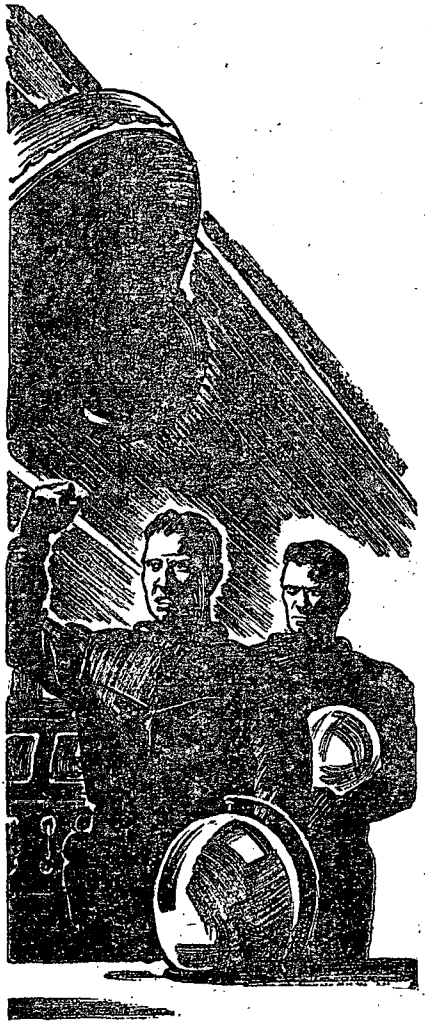
"He means a fight," said the skipper. "Tell him I'm here to offer another choice."

The *Llanvabon's* skipper and the skipper of the alien ship were face to face, but their communication was weirdly indirect. The aliens used no sound in communication. Their talk, in fact, took place on microwaves and approximated telepathy. But they could not hear, in any ordinary sense of the word, so the skipper's and Tommy's speech approached telepathy, too, as far as they were concerned. When the skipper spoke, his space phone sent his words back to the *Llanvabon*, where the words were fed into the coder and short-wave equivalents sent back to the black ship. The alien skipper's reply went to the *Llanvabon* and through the decoder, and was retransmitted by space phone in words read from the message frame. It was awkward, but it worked.



The short and stocky alien skipper paused. The helmet phones relayed his translated, soundless reply.

"He is anxious to hear, sir."

The skipper took off his helmet. He put his hands at his belt in a belligerent pose.

"Look here!" he said truculently to the bald, strange creature in the unearthly red glow before him. "It looks like we have to fight and one batch of us get killed. We're ready to do it if we have to. But if you win, we've got it fixed so you'll never find out where Earth is, and there's a good chance we'll get you anyhow! If we win, we'll be in the same fix. And if we win and go back home, our government will fit out a fleet and start hunting your planet. And if we find it we'll be ready to blast it to hell! If you win, the same thing will happen to us! And it's all foolishness! We've stayed here a month,

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and we've swapped information, and we don't hate each other. There's no reason for us to fight except for the rest of our respective races!"

The skipper stopped for breath, scowling. Tommy Dort inconspicuously put his own hands on the belt of his spacesuit. He waited, hoping desperately that the trick would work.

"He says, sir," reported the helmet phones, "that all you say is true. But that his race has to be protected, just as you feel that yours must be."

"Naturally!" said the skipper angrily, "but the sensible thing to do is to figure out how to protect it! Putting its future up as a gamble in a fight is not sensible. Our races have to be warned of each other's existence. That's true. But each should have proof that the other doesn't want to fight, but wants to be friendly. And we shouldn't be able to find each other, but we should be able to communicate with each other to work out grounds for a common trust. If our governments want to be fools, let them! But we should give them the chance to make friends, instead of starting a space war out of mutual funk!"

Briefly, the space phone said:

"He says that the difficulty is that of trusting each other now. With the possible existence of his race at stake, he cannot take any chance, and neither can you, of yielding an advantage."

"But my race," boomed the skipper, glaring at the alien captain, "my race has an advantage now. We came here to your ship in atom-powered spacesuits! Before we left, we altered the drives! We can set off ten pounds of sensitized fuel apiece, right here in this ship, or it can be set off by remote control from our ship! It will be rather remarkable if your fuel store doesn't blow up with us! In other words, if you don't accept my proposal for a commonsense approach to this predicament, Dort and I blow up in an atomic explosion, and your ship will be wrecked if not destroyed—and the *Llanvabon* will be attacking with everything it's got within two seconds after the blast goes off!"

The captain's room of the alien ship was a strange scene, with its dull-red illumination and the strange, bald, gill-breathing aliens watching the skipper and waiting for the inaudible translation of the harangue they could not hear. But a sudden tensity appeared in the air. A sharp, savage feeling of strain. The alien skipper made a gesture. The helmet phones hummed.

"He says, sir, what is your proposal?"

"Swap ships!" roared the skipper. "Swap ships and go on home! We can fix our instruments so they'll do no trailing, he can do the same with his. We'll each remove our star maps and records. We'll each dismantle our weapons. The air will serve, and we'll take their ship and they'll take ours, and neither one can harm or trail the other, and each will carry home

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more information than can be taken otherwise! We can agree on this same Crab Nebula as a rendezvous when the double-star has made another circuit, and if our people want to meet them they can do it, and if they are scared they can duck it! That's my proposal! And he'll take it, or Dort and I blow up their ship and the *Llanvabon* blasts what's left!"

He glared about him while he waited for the translation to reach the tense small stocky figures about him. He could tell when it came because the tenseness changed. The figures stirred. They made gestures. One of them made convulsive movements. It lay down on the soft floor and kicked. Others leaned against its walls and shook.

The voice in Tommy Dort's helmet phones had been strictly crisp and professional, before, but now it sounded blankly amazed.

"He says, sir, that it is a good joke. Because the two crew members he sent to our ship, and that you passed on the way, have their spacesuits stuffed with atomic explosive too, sir, and he intended to make the very same offer and threat! Of course he accepts, sir. Your ship is worth more to him than his own, and his is worth more to you than the *Llanvabon*. It appears, sir, to be a deal."

Then Tommy Dort realized what the convulsive movements of the aliens were. They were laughter.

It wasn't quite as simple as the skipper had outlined it. The actual working-out of the proposal was complicated. For three days the crews of the two ships were intermingled, the aliens learning the workings of the *Llanvabon's* engines, and the men learning the controls of the black spaceship. It was a good joke—but it wasn't all a joke. There were men on the black ship, and aliens on the *Llanvabon*, ready at an instant's notice to blow up the vessels in question. And they would have done it in case of need, for which reason the need did not appear. But it was, actually, a better arrangement to have two expeditions return to two civilizations, under the current arrangement, than for either to return alone.

There were differences, though. There was some dispute about the removal of records. In most cases the dispute was settled by the destruction of the records. There was more trouble caused by the *Llanvabon's* books, and the alien equivalent of a ship's library, containing works which approximated the novels of Earth. But those items were valuable to possible friendship, because they would show the two cultures, each to the other, from the viewpoint of normal citizens and without propaganda.

But nerves were tense during those three days. Aliens unloaded and inspected the foodstuffs intended for the men on the black ship. Men transshipped the foodstuffs the aliens would need to return to their home. There were endless details, from the exchange

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of lighting equipment to suit the eyesight of the exchanging crews, to a final check-up of apparatus. A joint inspection party of both races verified that all detector devices had been smashed but not removed, so that they could not be used for trailing and had not been smuggled away. And of course, the aliens were anxious not to leave any useful weapon on the black ship, nor the men upon the *Llanvabon*. It was a curious fact that each crew was best qualified to take exactly the measures which made an evasion of the agreement impossible.

There was a final conference before the two ships parted, back in the communication room of the *Llanvabon*.

"Tell the little runt," rumbled the *Llanvabon's* former skipper, "that he's got a good ship and he'd better treat her right."

The message frame flicked word-cards into position.

"I believe," it said on the alien skipper's behalf, "that your ship is just as good. I will hope to meet you here when the double star has turned one turn."

The last man left the *Llanvabon*. It moved away into the misty nebula before they had returned to the black ship. The vision plates in that vessel had been altered for human eyes, and human crewmen watched jealously for any trace of their former ship as their new craft took a crazy, evading course to a remote part of the nebula. It came to a crevasse of nothingness, leading to the stars. It rose swiftly to clear space. There was the instant of breathlessness which the overdrive field produces as it goes on, and then the black ship whipped away into the void at many times the speed of light.

Many days later, the skipper saw Tommy Dort poring over one of the strange objects which were the equivalent of books. It was fascinating to puzzle over. The skipper was pleased with himself. The technicians of the *Llanvabon's* former crew were finding out desirable things about the ship almost momently. Doubtless the aliens were as pleased with their discoveries in the *Llanvabon*. But the black ship would be enormously worth while—and the solution that had been found was by any standard much superior even to a combat in which the Earthmen had been overwhelmingly victorious.

"Hm-m-m. Mr. Dort," said the skipper profoundly. "You've no equipment to make another photographic record on the way back. It was left on the *Llanvabon*. But fortunately, we have your record taken on the way out, and I shall report most favorably on your suggestion and your assistance in carrying it out. I think very well of you, sir."

"Thank you, sir," said Tommy Dort.

He waited. The skipper cleared his throat.

"You . . . ah . . . first realized the close similarity of mental processes between the aliens and ourselves," he observed. "What do you think of the prospects of

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a friendly arrangement if we keep a rendezvous with them at the nebula as agreed?"

"Oh, we'll get along all right, sir," said Tommy. "We've got a good start toward friendship. After all, since they see by infrared, the planets they'd want to make use of wouldn't suit us. There's no reason why we shouldn't get along. We're almost alike in psychology."

"Hm-m-m. Now just what do you mean by that?" demanded the skipper.

"Why, they're just like us, sir!" said Tommy. "Of course they breathe through gills and they see by heat waves, and their blood has a copper base instead of iron and a few little details like that. But otherwise we're just alike! There were only men in their crew, sir, but they have two sexes as we have, and they have families, and . . . er . . . their sense of humor— In fact—"

Tommy hesitated.

"Go on, sir," said the skipper.

"Well— There was the one I called Buck, sir, because he hasn't any name that goes into sound waves," said Tommy. "We got along very well. I'd really call him my friend, sir. And we were together for a couple of hours just before the two ships separated and we'd nothing in particular to do. So I became convinced that humans and aliens are bound to be good friends if they have only half a chance. You see, sir, we spent those two hours telling dirty jokes."

THE END.

THE ANALYTICAL LABORATORY

Since the February issue carried only four fiction stories, there is no fifth place this time. Summarizing the general tone of reader letters received, rather than the actual place-vote numbers, would suggest a very close tie between the two longer items—the last installment of "Nomad" and "The Piper's Son," and an equally close tie between the shorter "Lilies of Life" and "Wanted—An Enemy". Incidentally, I expected more comment than I received on the fact that "Wanted—An Enemy" and "Nomad" were two independent, vastly different developments of the same cockeyed point of human nature.

The scoreboard reads:

Place	Story	Author	Points
1.	Nomad	Wesley Long	1.41
2.	The Piper's Son	Lewis Padgett	2.13
3.	Lilies Of Life	Malcolm Jameson	2.78
4.	Wanted—An Enemy	Fritz Leiber, Jr.	3.23

THE EDITOR

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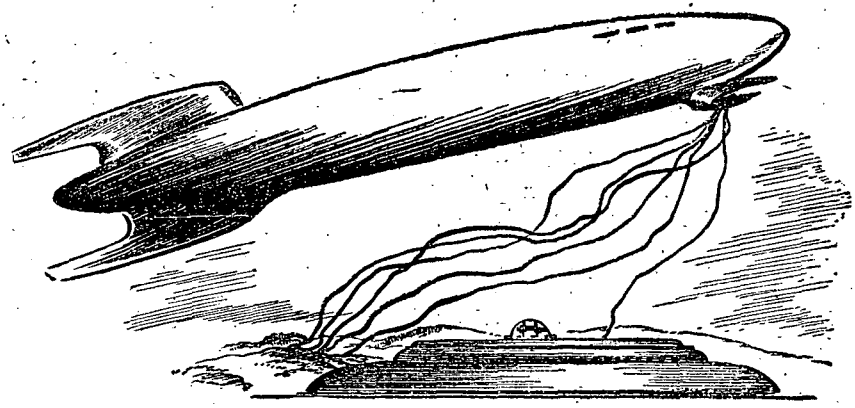
That life on other worlds might take strange forms is an old thought to science-fiction, in one sense. But that life might be a strange form—

The Trap

by FRANK BELKNAP LONG

Illustrated by Williams



It was a beautiful morning. The mist had come up deep and blue, the air was not too cold, and out of the blueness a great ship loomed, its hull outlined in garish radiance against a shimmer of light so vast and tumultuous it seemed to span the Galaxy.

"She's sure coming in fast!" called a voice from the star station.

William Hanley knocked the dottle from his pipe, and scowled at a rent in the mist where a few truant stars still hung like droplets of flame. At first the ship had loomed up soundlessly, but now the landing strip was vibrating, and the drone of the huge vessel's motors had become a deep, throbbing roar overhead.

"She'll take the station with her!" Hanley groaned. Then, as though his mind rejected the thought: "She'll veer—she'll have to. No astragator this side of the Coal Sack could be *that* malicious!"

As if in confirmation a sudden, vibrant clang rang out in the stillness. Not the resonant crash of

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buckling gravity plates, but the more reassuring sound of magnetic mooring cables clattering against a smooth metal hull.

Hanley stood perfectly motionless, his mouth hanging open. For an instant he had the distinct and awful feeling that he had parted company with his sanity. That the forward ends of mooring cables—a scant half-dozen magnetically groping strands—could steady and slow down a ship three hundred meters in length was against all reason.

Yet it was happening. From the great vessel's bow there projected a notched metal half-moon which gathered up the questing strands and bound them into a stabilizing skein a hundred yards from the mooring mast. Faster and faster, more and more incredibly, until the ship hung completely motionless—an immense, blue-black ellipsoid agleam with winking lights.

"Bill! Did you see that? Did you *see* it?"

Peering back over his shoulder, Hanley could make out the startled face of his assistant hovering like a plucked owl's head in the station's mist-filled doorway. As he stared in consternation young Gregg withdrew his head, and the mist which swirled in the doorway brightened. A moment later the station's one window glowed.

Hanley swore softly, aware of a stirring of panic deep down in his consciousness. Mingling with his alarm was an angry realization that Gregg was turning on all the lights in the station.

On a Rigel System refueling station a million light-years from nowhere time could hang heavy with uneventfulness. A process of desensitization could set in so profound that even the coming and going of trans-Galactic cruiser flotillas—"great old ships in sidereal splendors veiled"—impinged on the mind with a miragelike vagueness. Yet now, in a few brief moments, the pattern of months had been shattered.

Hanley knew what was happening, of course.

He was slowly going crazy.

A ship with a bowsprit that gobbled up mooring cables was on a par with young Gregg's habit of yodeling to the ogreish shadow-shapes which haunted the mist-draped planetoid from dawn to dusk. And Gregg was crazy, had been for months.

The youth hadn't been told yet, but he *was* crazy. How could he be safe and want to play a saxophone into the small hours, wrenching from that utterly base instrument music that made Hanley physically ill. Most of the time he stayed by himself at the far end of the dingy station, and that, too, was a bad sign.

Was lunacy contagious?

Behind Hanley there loomed four cyclopean fuel tanks, their conical summits bathed in a fuzzy glow. The star station, which was also conical, had been constructed out of discarded scraps of metal in great haste by a Galactic Commission engineer bent on getting back

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to Terra in time for the Christmas holidays.

"The tanks' young 'un," Gregg had ironically dubbed it.

There was no law, of course, to prevent Gregg from coining names for objects which got on his superior's nerves. But as Hanley swung about and strode into the wretched structure he told himself that Gregg was far more case-hardened than the average run of criminals. He was forever committing breaches of simple decency by refusing to keep his thoughts to himself. He—

Hanley shuddered, and stood blinking at the personification of all his woes regarding him from the depths of the station's dingy, blank-walled interior, the train of his thoughts derailed by something in the youth's stare which infuriated him to the core of his being.

The bright but rapidly disintegrating personality that was Gregg was not incapable of a kind of fish-cold sympathy which verged on condescension, verged on pity, and all because—

Well, because Gregg was forever insisting that he, Hanley, had no poetry in his soul, and no appreciation of what it meant to be an artist. Sporadically the youth painted, wrote poetry, and thought of himself generally as a misunderstood and maladjusted man of genius.

Actually there was no lazier youth this side of Betelgeuse. When something showed signs of blowing he could be a competent grease monkey, could climb all over the big tanks till sweat dripped from him. But that didn't mean he wasn't lazy. Things had to come to an almost calamitous pass before he'd exert himself.

Gregg sat now on a narrow cot with his hands locked across the back of his head, a slight frown creasing his handsome face. Having helped himself to one of Hanley's cigars, he was keeping his feet firmly planted on the floor, so that his superior would not suspect that he was wearing holes in a borrowed pair of cello socks.

"Well, Bill?" he said.

"Why did you duck out of sight just when I needed your advice?" Hanley flared.

Gregg looked startled. "You needed *my* advice?"

"Certainly." Hanley was bitter. "When you disagree with me, I know I'm right. When you don't, I have to watch my step."

Gregg took the cigar out of his mouth and stared hard at the glowing tip. "I don't think we should ignore the message just because there were no code numerals on the tape," he said. "I've a feeling it will be followed by an official message."

He looked up, serious concern on his face. "That's my honest opinion, and I'd advise you not to shrug it off just because you don't like the cut of my jib."

"That's for me to decide," Hanley snorted. Then his features softened: "The cut wouldn't matter

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so much if we had more elbow room. Shut two or six or a dozen men up together in a station this size for six months running and any one of ten million personality traits can produce downright hostile reactions. You get so you resent the way a guy draws on his socks."

He smiled bitterly. "Even when they're *your* socks."

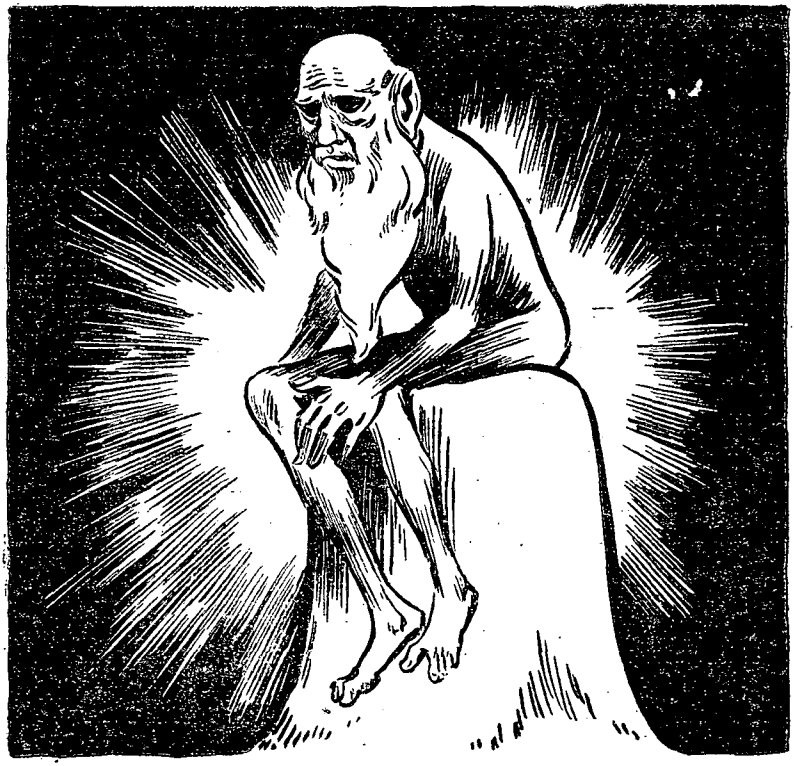
"Holes in mine," Gregg said, shamelessly. "You borrowed my magneto-razor, didn't you?"

"Yeah, and your second best pipe. It stank up the whole planetoid."

Hanley fumbled in his pocket, drew out a crumpled tele-message. "It doesn't mean a thing to me that this came in over a sidereal communications circuit," he said, defensively. "Any screwloose could have sent it."

He read aloud: "Ship of peculiar design and unknown origin, recently triangulated in Eridanus, is now believed to be approaching Orion. Vessel refuses to communicate."

"And that's all," Hanley grunted, crumpling the flimsy message for



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the twentieth time. "No description of the ship, no—"

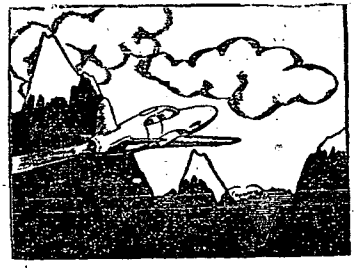
"How about 'peculiar design'?" Gregg asked.

"Do you call that a description?"

"Perhaps whoever sent that message wanted *you* to fill in the gaps," Gregg suggested, with a twisted smile. "If he'd said there was a ship loose in space with a cable-eating bowsprit, you know where you'd have tossed that message."

"It wouldn't have cost him anything to describe the ship!" was Hanley's embittered response.

"No, it wouldn't." Gregg admitted. "But perhaps some sympathetic little minor official somewhere knew there's nothing quite so unnerving as a terse, carefully-phrased understatement. Perhaps —"



"Stop right there!" Hanley snapped. "I'm sick and tired of your circumlocutions."

"But don't you see? He could be trying to warn you without stepping on official toes. The Commission may not want to commit itself—yet. So far the ship hasn't made port. The Commission may be waiting to see what happens when it does. A clever man would use just that approach—throw out a hint without seeming to do so."

"Anything more?" Hanley exploded.

"Only that we ought to thank our lucky stars the message came through when it did. We might have permitted her to refuel."

Hanley started across the room, Gregg's eyes following him. He swung about before he reached the door.

"Just a minute, Gregg. What do you suggest we do?"

Gregg's brooding gaze hovered between his superior and the glowing tip of his cigar.

"Well, nothing inside that ship can come out and descend to our peaceful little Utopia unless it suits our convenience. She may or may not have an antimagnetic hull, but the force-field she's nestling against couldn't be busted open by a runaway star with a core of pure deuterium."

"Go on."

Gregg blew a smoke ring and watched it ascend toward the ceiling. "We built that field up as a protection against piracy. If the crew refuse to image themselves in on the disk, we won't dissolve the field. We'll be within our rights unless—"

Gregg hesitated. "Unless their papers are in order, and a human face comes through. Even then we could tell them we're in quarantine. I've often thought that a human face *could* be simulated. On the disk, I mean—"

Hanley passed a hand over his

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brow. "Maybe we'd better start making arrangements now," he said.

"For what?"

"Your incarceration."

Gregg watched his superior swing about. This time Hanley did not pause or look back.

He's not telling me, Gregg thought, *but he'll be inside that ship in ten minutes.*

He started toward the door and then—inertia enfolded him like a winding sheet. Lord, how he hated to act, to make decisions, to do anything which went counter to the immense indolence which was his most outstanding character trait.

In some respects he was like those pioneer fossil amphibians, the lobe-fins. Not as good as reptiles, better than fishes, the lobe-fins had been caught up in a backwash of inertia on the eve of what might have been their greatest evolutionary triumph.

Compared to men of really vibrant energies he was a lobe-fin. He couldn't quite climb up over the bank because he liked to stretch himself out in the tidal muck, and bask in the warm sunlight.

He moved in a radiant little orbit of his own inside the immense, bustling beehive of activity which homo sapiens had set up.

Some day anthropologists were going to discover that the genus homo embraced six distinct species of men. Extinct were homo heidelbergensis, homo neanderthalensis, homo rhodesiensis and homo soloensis. Living were homo sapiens, and —homo indolensis.

Fortunately very few people suspected the existence of homo indolensis.

Gregg moved languidly to a bookcase and pulled out Hargrave's "Third Stage of Interstellar Expansion." It was a fascinating book because Hargrave, too, had been capable of deriving the most intense emotional satisfaction from just sitting sprawled out in a chair and letting his imagination run riot.

There could be no doubt that the impulse to sit and dream, to forego all exertion, was a progressive, specialized derivation from a much earlier attempt on the part of primitive man to shuffle off the immense responsibility of—fire and flint making, the pursuit of game, and the upbringing of a family.

An artist who could sit and paint lovely pink bison on the walls of the communal rock cavern didn't have to worry much about any of those things. When game was plentiful his needs were supplied by other, less imaginative members of the tribe. But when the development became too specialized—

A bitterness tightened Gregg's lips. He could, of course, have forcibly prevented Hanley from sticking out his neck. He had the edge on Hanley in physical strength and could have restrained him with very little effort. Why hadn't he?

Within the scope of his inertia he was not incapable of exerting himself in a dramatic, forceful way. He shrank only from making long-range decisions, from shouldering great, dull burdens, from becoming enmeshed in aggressive arguments with people who did not possess

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enough intelligence to argue imaginatively about anything.

A lobe-fin? Why did he persist in kidding himself? He was in all respects the exact opposite of a lobe-fin. His inertia was the inertia of a tremendous creativeness anchored in the pleasure principle, a creativeness that had to be stimulated in just the right way, or—it wouldn't play ball. It was a physiological fact that when creative impulses were thwarted inertia enveloped the body, a sluggishness crept into the brain.

He didn't feel exactly sluggish now, however. Not mentally sluggish. He had a feeling that out in the mist something might very well be taking place which would have stripped his inertia from him—could he have but seen it.

His head felt suddenly cold. Not just his face, but his entire head, the top of his skull especially.

Why hadn't he tried to stop Han-

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ley? Was it because, subconsciously, he'd known that Hanley feared nothing he could not come to physical grips with? The one thing Hanley couldn't do was sit and dream. And when a practical man goes forth to take a bull by the horns, half-expecting to be gored, a practical man, a dreamer, had no right to interfere.

Gregg opened "The Third Stage of Interstellar Expansion," and removed the bookmark he'd placed opposite Chapter 2. He began, slowly, to read: "As for the possibility of life on other worlds—"

He has taken the first step. There were two. Why did the other not come?

The thought moved slowly along the passageway, and hovered above Hanley. The thought pulsed, and moved down the wall and across the floor of the passageway. It hovered above Hanley from the opposite wall, comprehending him.

Hanley stood just inside the air lock examining a passageway which seemed covered with the dust of centuries, his heart thudding against his ribs.

In the narrow swath of radiance cut by his glow torch he could see the dust clearly. It was greenish-yellow, mildewed over with moist threads of fungus growth which adhered to his shoes when he lifted first his right foot, then his left.

He does not need the light he is carrying. Surely he can see without the light.

A dull radiance suffused the passageway, so that when Hanley clicked off the torch he was not in darkness.

There was a musty smell in the passageway, and in the wider corridor which branched off from it. The walls of the ceiling were covered with mildew, and when he moved, his head felt suddenly cold. Not just his face, but his entire head, the top of his skull especially.

The corridor startled Hanley, not because it was empty, but because it was so full of strange, angular shadows. The room at the end of the corridor startled him still more.

The room wasn't empty. In the dim light Hanley could make out a circular metal chair, and the dim outlines of a seated figure. The chair was faintly luminous, and seemed not so much an article of furniture as an extension of the floor which had mushroomed into a chilling circularity in the precise middle of the room.

Touch him. He was once like yourself.

The seated figure bore an unmistakable resemblance to a shrunken old man with thinning hair and a greenish-yellow beard. But when Hanley reached out and touched the beard, it crumpled, leaving a dampness on his palm. Mildew, dust came away, revealing a gleaming clavicle, and hollow eye sockets which seemed to be staring past Hanley at something on the opposite wall.

The wall. If you would know more, scrape—scrape away the dust.

For a terrifying instant Hanley had an apprehension that something

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in the room was trying to communicate with him. It was as though there were a living presence in the room which could force him to obey its unspoken commands.

Could force him? With a convulsive shudder Hanley turned, and stumbled from the room. Out in the corridor another heart-stopping spasm shook him. For an instant he was on the verge of giving way completely to his terror. Then—anger flooded into his brain. Nothing he couldn't see could force him to do something he didn't want to do. Nothing—nothing—

He was standing in another room. The chair was larger and more disturbingly circular, more disturbingly *shaped* than the chair in the room from which he had fled. The seated figure was larger too.

He is beginning to understand. This was a very ancient one of his own kind. Will he scrape away the dust?

The seated figure was vaguely humanoid in appearance, but its teeth were very large, and enormous brow ridges arched above its hollow eyes. Sweat was trickling down Hanley's face, and something seemed to be pressing against his mind, blurring his thought processes. Like a skull he'd seen somewhere. Unutterably remote, behind glass in a dim shadowed hall. A pug-faced ape that had decided to become a man, in the vaguest way shambling through a forest primeval. Ugly, snarling—

Hanley forced his mind back to awareness. He wasn't standing in a museum on Terra. All through his body he could feel a tension mounting. There was a dense coating of dust on the creature's heavy, almost chinless jaw and its limbs were so thickly coated with dust they seemed enmeshed in cobwebs.

Scrape—scrape away the dust.

Hanley turned, and stumbled from the room.

It was a very large and silent room, and the light was so dim that Hanley had to strain to see the back of the seated figure's head. The chair was squarish rather than circular, and so high that the figure's short, spindly legs barely touched the floor. The skull was massive—more birdlike than apelike.

Hanley groped his way out of the room.

It was a skeleton, but the head grew out from the middle of the squat torso, and long, translucent talons curved about the arms of the chair.

The crusted suns spawned him-her in the night of a long begetting. The wall. Scrape away the dust.

When at last Hanley found himself scraping away the dust on the wall of a very dim, circular chamber deep within the bowels of the ship his lips were twitching, and he could no longer control the trembling of his hands.

Behind him loomed a chair which had seemingly mushroomed up out of the floor in a frenzied attempt to support and contain a growth so prolific that not even death could prevent it from spawning. The many-tubed occupant of the chair

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was not a skeleton. There were no articulations, nothing but a clotted mass of tendrils spilling over the arms of the chair, and snaking out across the floor. Its young lay scattered about the chamber—tiny medusa-heads, desiccated and loathsome.

A chair in which to sit and dream.

Hanley started, for the words had come unbidden into his mind, and had no relation at all to the frantic scrapings he was making with his pocket knife on the smooth metal wall.

The design, when it came into view, did not startle him as much as he had anticipated it would.

He was conscious that his palms were sweating. How—how had he known he was going to uncover a design? He hadn't known, couldn't have known.

It wasn't important anyway. Only the design was important. It was engraved deeply on the metal and almost it seemed geometrical, and overlapping series of circles superimposed on triangles.

He has taken the second step. A chair in which to dream and die.

The design was sharply-etched, and yet it seemed to possess a kind of physi-mathematical mobility. As Hanley stared the corners of the triangles blurred, and the circles dissolved into a pinwheeling blur of radiance.

Then—

Gaze deeply on that which is now a stillness, now a dreaming—forever and forever a dreaming and a stillness.

Hanley was shivering convulsively when he left the room.

The room was quite brightly illumed, and there was no dust at all on the wall. And the chair was like the first chair he'd seen, designed to support and contain not an alien inhabitant of a planet encircling some distant sun, but a man of about his own height and weight—

Hanley knew that he had found the *right* chair even as he seated himself. There was no dust on the wall, and he could see the design clearly. At first he saw only the

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design and then—a strange beauty danced on the wall. A beauty and a growing wonder that he could have so quickly progressed from a childish reluctance, a childish drawing back to the all-embracing glory of—

The music was faint at first, but gradually, as Hanley stared, it grew louder. But even when it filled the room it seemed to come from distances immeasurably remote.

It was like no music Hanley had ever heard. It throbbed and it pulsed, and there were times when it seemed cruel, almost torturing, and times when it was a sweetness ineffable which kept company with his thoughts as he voyaged mathematically afar, through stellated caverns of stillness and aisles of incredibly converging prisms—

Thomas Gregg sat on the edge of the cot, with "The Third Stage of Interstellar Expansion" spread out on his knees. It was a very large and bulky book, and one of the folding illustrations had come unhinged, so that a filmy star field seemed to float between his waist and the floor. He was reading aloud, in a voice that trembled a little with the intensity of his emotion.

"We are far too prone to think of life as exclusively a biological phenomenon. If a creature moves about and absorbs nourishment and reproduces itself, we say that it is alive. But pure form, pure design, may also be a manifestation of life.

"In the dim infancy of our race, when it was believed that the soul of a dead man could leave the buried body by night to suck the blood of living persons a curious expression gained currency, *the blood is the life.*

"In a coldly scientific sense it may be said that even the most primitive superstitions bear a casual relation to reality, for without their aid certain ideas could not be easily expressed or explained, or a satisfying mind picture built up. For instance, a thing is shaped in a certain way, and it lives. Destroy the pattern and it dies. How can we be sure that on some far planet that has not yet known the tread of man the *form* may not be the life?

"The form is the life!

" . . . neither should we assume that such a life would stay confined to the planet of its origin, for it is not in the nature of life to forego all questing. In the course of ages a decorative-locomotive synthesis would doubtless be built up. In the course of ages a far-voyaging synthesis—perhaps in certain superficial aspects not unlike the slender stellar craft which have carried our own kind to the farthest star—might well seek out new worlds to conquer.

"As to what form that questing would take, who can say? A life that is decorative, a life that is pure form, pure design, would have a tendency, perhaps, to seek above all things *appreciation.*"

Gregg snapped the book shut, stood up, yawned, and walked to the door of the star station.

It was a beautiful morning. The mist had come up deep and blue, the

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air was not too cold and out of the blueness a great ship loomed, its hull outlined in garish radiance against a shimmer of light so vast and tumultuous it seemed to span the Galaxy.

On a Betelgeuse System refueling station a million light-years from nowhere time could hang heavy with uneventfulness..

But now somehow Gregg was strangely stirred.

Not that the ship was even remotely like the one he'd dragged a babbling and completely demoralized Hanley from a decade before. But somehow, just reading Hargrave's book had brought it all back. A revised edition of Hargrave's book, of course, with that very memorable passage inserted *after* he, Gregg, had explored three or four of the rooms inside the vessel.

Shutting his eyes, Gregg could see again the great ship regurgitating her mooring cables, slipping out into the void with a vibrant droning.

It seemed only yesterday that he'd proved to himself that an impractical man, a dreamer, could be stronger inwardly than a hard-bitten extrovert. He'd saved Hanley without succumbing himself, and now soon he'd be going back to Terra to bask in the affluence which "The Third Stage of Interstellar Expansion" had brought him.

After ten years of lonely exile, five under Rigel, five under Betelgeuse, the world had at last discovered that William Hargrave, alias Thomas Gregg, poet, musician, painter, and, in his more energetic moments, star station grease monkey par excellence, was an astrahistorian of the first rank, and a man of tremendous creative energies.

Smiling a little, Gregg passed through the narrow doorway and out across the landing strip with his arms upraised, partly as a welcoming gesture to the crew of the incoming vessel, partly in sheer exuberance because the dawn was so beautiful.

THE END.

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The One-Eyed Man

by PHILIP ST. JOHN

A mechanical educator, a device capable of giving a twelve-year-old a complete adult education, might result in unexpected mental blindness—wherein even the one-eyed man had powers!

Illustrated by Orban

A blank-faced zombi moved aside as Jimmy Bard came out of the dictator's office, but he did not notice it; and his own gesture of stepping out of the way of the worried, patrolling adult guards was purely automatic. His tall, well-muscled body went on doing all the things long habit had taught it, while his mind churned inside him, rebelling hopelessly at the inevitable.

For a moment, the halls were free of the countless guards, and Jimmy moved suddenly to one of the walls, making quick, automatic motions with his hands. There

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was no visible sign of change in the surface, but he drew a deep breath and stepped forward; it was like breasting a strong current, but then he was inside and in a narrow passageway, one of the thousands of secret corridors that honeycombed the whole monstrous castle.

Here there could be no adults to remind him of what he'd considered his deficiencies, nor of the fact that those deficiencies were soon to be eliminated. The first Dictator Bard had shared the secret of the castle with none save the murdered men who built it; and death had prevented his revealing it even to his own descendants. No tapping would ever reveal that the walls were not the thick, homogeneous things they seemed, for tapping would set off alarms and raise stone segments where needed, to make them as solid as they appeared. It was Jimmy's private kingdom, and one where he could be bedeviled only by his own thoughts.

But today, those were trouble enough. Morbid fascination with them drove him forward through the twisting passages until he located a section of the wall that was familiar, and pressed his palm against it. For a second, it seemed cloudy, and then was transparent, as the energies worked on it, letting vibration through in one direction only. He did not notice the quiet sounds of those in the room beyond, but riveted his eyes on the queer headpieces worn by the two girls and single boy within.

Three who had reached their twelfth birthday today and were about to become adults—or zombis! Those odd headpieces were electronic devices that held all the knowledge of a complete, all-embracing education, and they were now working silently, impressing that knowledge onto the minds of their wearers at some two hundred million impulses a second, grooving it permanently into those minds. The children who had entered with brains filled only with the things of childhood would leave with all the information they could ever need, to go out into the world as full adults, if they had withstood the shock of education. Those who failed to withstand it would still leave with the same knowledge, but the character and personality would be gone, leaving them wooden-faced, soulless zombis.

Once Jimmy had sat in one of those chairs, filled with all the schemes and ambitions of a young rowdy about to become a man. But that time, nothing had happened! He could remember the conferences, the scientific attempts to explain his inability to absorb information from the compeller Aaron Bard had given the world, and his own tortured turmoil at finding himself something between an adult and a zombi, useless and unwanted in a world where only results counted. He had no way of knowing, then, that all the bitter years of adjusting to his fate and learning to survive in the contemptuous world were the result of a fake. It was

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only within the last hour that he had discovered that.

"Pure fake, carefully built up!" His father had seemed proud of that, even over the worry and desperation that had been on his face these last few days. "The other two before you who didn't take were just false leads, planted to make your case seem plausible; same with the half dozen later cases. You'd have burned—turned zombi, almost certainly. And you're a Bard, some day to dictate this country! I took the chance that if we waited until you grew older, you'd pass, and managed to use blank tapes. Now I can't wait any longer. Hell's due to pop, and I'm not ready for it, but if I can surprise them, present you as an adult— Be back here at six sharp, and I'll have everything ready for your education!"

Ten years before, those words would have spelled pure heaven to him. But now the scowl deepened on his forehead as he slapped off the one-way transparency. He'd learned a lot about this world in those ten years, and had seen the savage ruthlessness of the adults. He'd seen no wisdom, but only cunning and cleverness come from the Bard psychicompellers.

"Damn Aaron Bard!"

"Amen!" The soft word came sighing out of the shadows beside the boy, swinging him around with a jerk. Another, in here! Then his eyes were readjusting to the pale, bluish glow of the passages, and he made out the crouched form of an elderly man, slumped into one of the corners. That thin, weary figure with bitter mouth and eyes could never be a castle guard, however well disguised, and Jimmy breathed easier, though the thing that might be a weapon in the hands of the other centered squarely on him.

The old man's voice trembled faintly, and there were the last dregs of bitterness in it. "Aaron Bard's damned, all right. I thought his discovery of one-way transparency was lost, though, along with controlled interpenetrability of matter—stuff around which to build a whole new science! And yet, that's the answer; for three days I've been trying to find a trapdoor or sliding panel, boy, and all the time the trick lay in matter that could be made interpenetrable! Amusing to you?"

"No, sir." Jimmy held his voice level and quite normal. A grim ability to analyze any situation had been knocked into him during the years of his strangeness in a world that did not tolerate strangeness, and he saw the man was close to cracking. He smiled quietly—and moved without facial warning, with the lightning reaction he had forced himself to learn, ripping the weapon out of weakened hands. His voice was still quiet. "I don't know how you know those things, nor care. The important thing is to keep you from letting others know, and—"

Sudden half-crazed laughter cut his words off. "Go back to the others and tell them! Go back and be tortured again! They'd love

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that. Aaron Bard's come back to tell us about some more of his nice discoveries! So sweet of you to call, my dear! I'm damned all right, by my own reputation."

"But Aaron Bard's been dead eighty years! His corpse is preserved in a glass coffin on exhibition; I've seen it myself." And yet there was more than simple insanity here; the old man had known the two secrets which were discovered by Aaron Bard and which his son, the first dictator, had somehow managed to find and conceal after the inventor's death in an explosion. But the man was speaking again, his voice weak and difficult.

"What does a mere eighty years mean; or a figure of wax in a public coffin? The real body they held in sterile refrigeration, filled with counter enzymes—my own discovery, again! You know it?"

Jimmy nodded. The Russians had found safe revival of dogs possible even after fifteen minutes of death; later, men had been operated on in death, where it served better than anaesthesia, and revived again. The only limit had been the time taken by the enzymes of the body to begin dissolving the tissues; and with the discovery by Aaron Bard of a counteracting agent, there had ceased to be any theoretical limit to safe revival. Dying soldiers in winter had injected ampules of it and been revived days or weeks later, where the cold had preserved them. "But—eighty years!"

"Why not—when my last experiment dealt with simple atomic power, rather than the huge, cumbersome U-235 method? Think what it would mean to an army! My son did—he was very clever at thinking of such things. Eighty years, until they could perfect their tissue regrowing methods and dare to revive my body." He laughed again, an almost noiseless racking of his exhausted shoulders, and there was the hint of delirious raving in his voice now, though the words were still rational.

"I was so pathetically grateful and proud, when they revived me. I was always gratefully proud of my achievements, you know, and what they could do for humanity. But the time had been too long—my brain only seemed normal. It had deteriorated, and I couldn't remember all I should; when I tried too hard, there were strange nightmare periods of half insanity. And their psychological torture to rip the secret from me didn't help. Two months of that, boy! They told me my name was almost like a god's in this world, and then they stopped at nothing to get what they wanted from that god! And at last I must have gone mad for a time; I don't remember, but somehow I must have escaped—I think I remember something about an air shaft. And then I was here, lost in the maze, unable to get out. But I couldn't be here, could I, if the only entrance was through interpenetrable stone panels that I couldn't energize?"

"Easy, sir." Jimmy slipped an arm under the trembling body of

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Aaron Bard and lifted him gently. "You could, all right. There's one out of order, in constant interpenetrable condition in an old air shaft. That's how I first found all this, years ago. There's some soup I can heat in my rooms, and you won't have to go back to them."

He might as well do one decent and human thing, while his mind was still his own, untouched by the education machine. And seeing this bitter, suffering old man, he could no longer hate Aaron Bard for inventing it. The man had possessed a mind of inconceivable scope and had brought forth inventions in all fields as a cat brings forth kittens, but their misuse was no fault of his.

And suddenly it occurred to him that here in his arms was the reason for the desperation his father felt. They couldn't know of the interpenetrable panel, and the search that had undoubtedly been made and failed could have only one answer to them; he must have received outside help from some of the parties constantly plotting treason. With the threat of simple atomic power in such hands, no wonder his dictator father was pulling all his last desperate tricks to maintain the order of things! Jimmy shook his head; it seemed that everything connected with Aaron Bard led to the position he was in and the inevitable education he must face. For a brief moment he hesitated, swayed by purely personal desires; then his hand moved out to the panel, and he was walking through into his own room, the aged figure still in his arms.

Later, when the old scientist had satisfied some of the needs of his body and was sitting on the bed, smoking, his eyes wandered slowly over the rows of books on the shelves about the room, and his eyebrows lifted slightly. "'The Age of Reason', even! The first books I've seen in this world, Jimmy!"

"Nobody reads much, any more, so they don't miss them at the old library. People prefer vision for amusement and the compeller tapes if they need additional information. I started trying to learn things from them, and reading grew to be a habit."

"Um-m-m. So you're another one-eyed man?"

"Eh?"

Bard shrugged, and the bitterness returned to his mouth. "'In the country of the blind, the one-eyed man is—killed!' Welles wrote a story about it. Where . . . when . . . I came from, men had emotional eyes to their souls, and my guess is that you've been through enough to develop your own. But this world is blind to such things. They don't want people to see. It's the old rule of the pack: Thou shalt conform! Jimmy, how did all this come to be?"

Jimmy frowned, trying to put it into words. The start had probably been when Aaron Bard tried his newly invented psychicompeller on his son. The boy had liked that way of learning, and stolen other

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experimental tapes, building with his cold, calculating little brain toward the future already. Unerringly, he'd turned to the army, apparently sensing the coming war, and making the most of it when it came. Fifteen years of exhausting, technological warfare had let him induce the educator to furnish the technical men needed, and had seen him bring forth stolen secret of his father's after stolen secret, once the scientist's accidental death had left him alone in possession of Bard's files. With the war's end, the old education system was gone, and boys of twelve were serving as technicians at home until they could be replaced for active duty when old enough.

Those same boys, grown to men and desiring the same things he did, had made possible his move from general to president, and finally to dictator. He'd even adopted the psychicompeller as his heraldic device. And the ever-increasing demands of technology made going back to old methods impossible, and assured him a constant supply of young "realists."

Bard interrupted. "Why? It would have been hard—getting an education was always difficult and becoming worse, which is why I tried to make the compeller—but it would have been worth it when they saw where it led. After all, without such help I managed to find a few things—even if they turned out to be Frankenstein monsters!"

"But you depended on some odd linkage of simple facts for results, and most men can't; they need a multitude of facts. And even then, we still follow you by rote in some things."

"Too easy knowledge. They aren't using it—when they get facts, they don't have the habits of hard thinking needed to utilize them. The compeller can't give those habits; only years of hard, disciplined work can do that. I noticed the meager developments of new fields—but when they began making these . . . uh . . . zombis—"

Jimmy punched a button, and nodded toward the creature that entered in answer. It began quietly clearing the room, removing the evidence of Bard's meal, while the scientist studied it. "There's one. He knows as much as any adult, but he has no soul, no emotions, you might say. Tell him to do something, and he will—but he won't even eat without orders."

"Permanent mechanical hypnosis," Bard muttered, and there was hell in his eyes. Then his mouth hardened, while the eyes grew even grimmer. "I never foresaw that, but—you're wrong, and it makes it even worse! You . . . uh . . . 4719, answer my questions! Do you have emotions such as hatred, fear, or a sense of despair?"

Jimmy started to shake his head, but the zombi answered dully before him. "Yes, master, all those!"

"But you can't connect them with your actions—is that right? You're two people, one in hell and unable to reach the other?"

The affirmative answer was in the

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same dull tone again, and the zombi turned obediently and left at Bard's gesture. Jimmy wiped sudden sweat from his forehead. He'd been hoping before that he might fail the compeller education as a release, but this would be sheer, unadulterated hell! And the psychologists must know this, even though they never mentioned it.

"And ten percent of us are zombis! But only a very few at first, until the need for ever more knowledge made the shock of education greater. By then—the world had accepted such things; and some considered them a most useful by-product, since they made the best possible workers." His own voice grew more bitter as he forced it on with the history lesson, trying to forget the new and unwelcome knowledge.

Bard's son had built the monstrous castle with its secret means for spying, and had fled into the passages with his private papers to die when his own son wrested control from him. It was those moldy papers that had shown Jimmy the secret of escape when he'd stumbled into the labyrinth first. After that, the passage of dictatorship from father to son had been peaceful enough, and taken for granted. On the whole, there had been little of the deliberate cruelty of the ancient Nazi regime, and the dictatorial powers, while great, were not absolute. The people were used to it—after all, they were products of the compeller, and a ruthless people, best suited by dictatorial government.

Always the compeller! Jimmy hesitated for a moment, and then plunged into the tale of his own troubles. "So I'm to be made into a beast, whether I like it or not," he finished. "Oh, I could turn you in and save myself. If I were an adult, I would! That's why I hate it, even though I might like it then. It wouldn't be me—it'd be just another adult, carrying my name, doing all the things I've learned to hate! I can save myself from becoming one of them—by becoming one!"

"*Requiescat in pace!* Let the dead rest in peace! If you wake them, they may learn they've made a ghastly mess of the world, and may even find themselves ruining the only person in all that world whom they like!" Aaron Bard shook his head, wrinkles of concentration cutting over the lines of pain. "The weapon you took from me isn't exactly harmless. Sometime, during my temporary insanity, I must have remembered the old secret, since I made it then, and it's atom-powered. Maybe, without a dictator—"

"No! He's weak, but he's no worse than the others; I couldn't let you kill my father!"

"No, I suppose you couldn't; anyhow, killing people isn't usually much of a solution. Jimmy, are you sure there's any danger of your being made like the others?"

"I've seen the results!"

"But have you? The children are given no education or discipline

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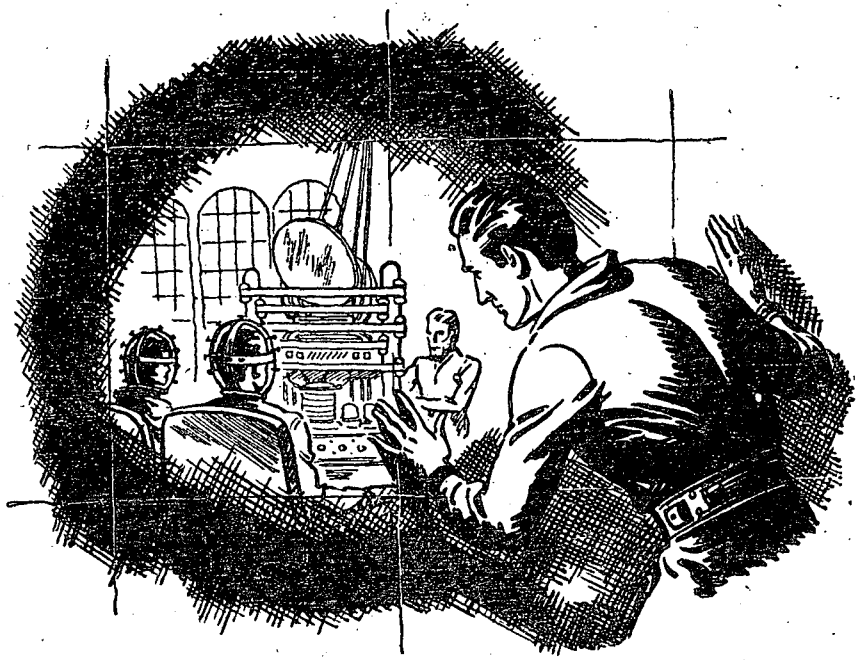

until they're twelve, and then suddenly filled with knowledge, for which they haven't been prepared, even if pre-adolescents can be prepared for all that—which I don't believe. Even in my day, in spite of some discipline and training, twelve-year-old boys were little hoodlums, choosing to group together into gangs; wild, savage barbarians, filled with only their own egotism; pack-hunting animals, not yet civilized. Not cruel, exactly, but thoughtless, ruthless as we've seen this world is. Maybe with the sudden new flood of knowledge for which they never worked they make good technicians; but that spurious, forced adulthood might very well discourage any real maturity; when the whole world considers them automatic adults, what incentive have they to mature?"

Jimmy thought back over his early childhood, before the education fizzle, and it was true that he and the other boys had been the egocentric little animals Bard described; there had been no thought of anything beyond their immediate whims and wants, and no one to tell them that the jungle rule for survival of the fittest should be tempered with decency and consideration for others. But the books had taught him that there had been problem children and boy-

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gangs before the compeller—and they had mostly outgrown it. Here, after education, they never changed; and while the pressure of society now resisted any attempt on their part to change, that wasn't the explanation needed; other ages had developed stupid standards, but there had always been those who refused them before.

"Do you believe that, sir?"

The old man shrugged slightly. "I don't know. I can't be sure. Maybe I'm only trying to justify myself. Maybe the educator does do something to the mind, carefully as I designed it to carry no personal feelings to the subject. And while I've seen some of the people, I haven't seen enough of their private life to judge; you can't judge because you never knew normal people. When I invented it, I had serious doubts about it, for that matter. They still use it as I designed it, exactly?"

"Except for the size of the tapes."

"Then there's a wave form that will cancel out the subject's sensitivity, blanket the impulse, if broadcast within a few miles. If I could remember it—if I had an electronics laboratory where I could try it—maybe your fake immunity to education might be made real!"

Relief washed over the younger man, sending him to his feet and to the panel. "There *is* a laboratory. The first dictator had everything installed for an emergency, deep underground in the passages. I don't know how well stocked it is, but I've been there."

He saw purpose and determination come into the tired face, and Aaron Bard was beside him as the panel became passable. Jimmy turned through a side way that led near the senatorial section of the castle. On impulse he turned aside and motioned the other forward. "If you want an idea of our private life, take a look at our senators and judge for yourself."

The wall became transparent to light and sound in one direction and they were looking out into one of the cloakrooms of the Senate Hall. One of the middle-aged men was telling a small audience of some personal triumph of his: "Their first kid—burned—just a zombi! I told her when she turned me down for that pimple-faced goon that I'd fix her and I did. I spent five weeks taking the kid around on the sly, winning his confidence. Just before education, I slipped him the dope in candy! You know what it does when they're full of that and the educator starts in."

Another grinned. "Better go easy telling about it; some of us might decide to turn you in for breaking the laws you helped write against using the stuff that way."

"You can't prove it. I'm not dumb enough to give you birds anything you could pin on me. Just to prove I'm the smartest man in this bunch, I'll let you in on something. I've been doing a little thinking on the dictator's son—"

"Drop it, Pete, cold! I was with a bunch that hired some fel-

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lows to kill the monkey a couple years ago—and you can't prove that, either! We had keys to his door and everything; but he's still around, and the thugs never came back. I don't know what makes, but no other attempt has worked. The dictator's got some tricks up his sleeve, there."

Jimmy shut the panel off, and grinned. "I don't sleep anywhere near doors, and there's a section of the floor that can be made interpenetrable, with a ninety-foot shaft under it. That's why I wangled that particular suite out of my father."

"Those are the senators?" Bard asked.

"Some of the best ones." Jimmy went on, turning on a panel now and again, and Bard frowned more strongly after each new one. Some were plotting treason, others merely talking. Once something like sympathy for the zombis was expressed, but not too strongly. Jimmy started to shut the last panel off, when a new voice started.

"Blane's weakling son is dead. Puny little yap couldn't take the climate and working with all the zombis in the mines; committed suicide this morning."

"His old man couldn't save him from that, eh? Good. Put it into the papers, will you? I want to be sure the dictator's monkey gets full details. They were thick for a while, you know."

Jimmy's lips twisted as he cut off suddenly. "The only partly human person I ever knew—the one who taught me to read. He was a sickly boy, but his father managed to save him from euthanasia, somehow. Probably he went around with me for physical protection, since the others wouldn't let him alone. Then they shipped him to some mines down in South America, to handle zombi labor."

"Euthanasia? Nice word for killing off the weak. Biologically, perhaps such times as these may serve a useful purpose, but I'd rather have the physically weak around than those who treat them that way! Jimmy, I think if my trick doesn't work and the educator does things to you it shouldn't, I'll kill you before I kill myself!"

Jimmy nodded tightly. Bard wasn't the killing type, but he hoped he'd do it, if such a thing occurred. Now he hurried, wasting no more time in convincing the other of the necessity to prevent such a change in him. He located the place he wanted and stepped in, pressed a switch on the floor, and set the lift to dropping smoothly downward.

"Power is stolen, but cleverly, and no one has suspected. There are auxiliary fuel batteries, too. The laboratory power will be the same. And here we are."

He pointed to the room, filled with a maze of equipment of all kinds, neatly in order, but covered with dust and dirt from long disuse. Aaron Bard looked at it slowly, with a wry grin.

"Familiar, Jimmy. My son apparently copied it from my old laboratory, where he used to fiddle around sometimes, adapting my stuff to military use. With a little

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decency, he'd have been a good scientist; he was clever enough."

Jimmy watched, some measure of hope coming to him, as the old man began working. He cleared the tables of dust with casual flicks of a cloth and began, his hands now steady. Wires, small tubes, coils, and various other electronic equipment came from the little boxes and drawers, though some required careful search. Then his fingers began the job of assembling and soldering them into a plastic case about the size of a muskmelon, filled almost solidly as he went along.

"That boy who taught you how to read—was he educated at the age of twelve?"

"Of course—it's compulsory. Everyone has to be. Or—" Jimmy frowned, trying to remember more clearly; but he could only recall vague hints and phrases from bits of conversation among Blane's enemies. "There was something about falsified records during the euthanasia judgment proceedings, I think, but I don't know what records. Does it matter?"

Bard shrugged, scribbling bits of diagrams on a scrap of dirty paper before picking up the soldering iron again. "I wish I knew—Um-m-m? In that fifteen-year war, when they first began intensive use of the compeller, they must have tried it on all types and ages. Did any scientist check on variations due to such factors? No, they wouldn't! No wonder they don't develop new fields. How about a book of memoirs by some soldier who deals with personalities?"

"Maybe, but I don't know. The diary of the first dictator might, if it could be read, but when I tried after finding it, I only got hints of words here and there. It's in some horrible code—narrow strips of short, irregularly spaced letter groups, pasted in. I can't even figure what kind of a code it is, and there's no key."

"Key's in the library, Jimmy, if you'll look up Brak-O-Dite—machine shorthand. He considered ordinary typing inefficient; one time when I thoroughly agreed with him. Damn!" Bard sucked on the thumb where a drop of solder had fallen, and stared down at the tight-packed parts. He picked up a tiny electrolytic condenser, studied the apparatus, and put it down again doubtfully. Then he sat motionlessly, gazing down into the half-finished object.

The work, which had progressed rapidly at first, was now beginning to go more slowly, with long pauses while the older man thought. And the pauses lengthened. Jimmy slipped out and up the lift again, to walk rapidly down a corridor that would lead him to the rear of one of the restaurants of the castle. The rats had been blamed for a great deal at that place, and they were in for more blame as Jimmy slid his hands back into the corridors with coffee and food in them.

Bard gulped the coffee gratefully, as he looked up to see the

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younger man holding out the food, but he only sampled that. His hands were less sure again. "Jimmy, I don't know—I can't think. I get so far, and everything seems clear; then—*pfft!* It's the same as when I first tried atomic power; there are worn places in my mind—eroded by eighty years of death. And when I try to force my thoughts across them, they stagger and reel."

"You've got to finish it! It's almost five, and I have to report back at six!"

Bard rubbed his wrinkled forehead with one hand, clenching and opening the other. For a time, then, he continued to work busily, but there were long quiet intervals. "It's all here, except this one little section. If I could put that in right, it'd work—but if I make a mistake, it'll probably blow out, unless it does nothing."

Jimmy stared at his watch. "Try it."

"You solder it; my hands won't work any more." Bard slipped off the stool, directing the boy's hands carefully. "If I could be sure of making it by going insane, as I did the atom gun, I'd even force my mind through those nightmares again. It would be better than having you take the compulsion with your mind fighting itself. But I might decide to do almost anything else, instead— No, that's the antennae—one end remains free."

The hands of the watch stood at ten minutes of six as the last connection was made and Bard plugged it into the socket near the floor. Then the tubes were warming up. There was no blow-out, at least; the tubes continued to glow, and a tiny indicator showed radiations of some form coming from the antennae. Jimmy grinned, relief stronger in him, but the older man shook his head doubtfully as they went back to the lift again.

"I don't know whether it's working right, son. I put that last together by mental rule of thumb, and you shouldn't work that way in delicate electronic devices, where even two wires accidentally running beside each other can ruin things! But at least we can pray. And as a last resort—well, I still have the atom pistol."

"Use it, if you need to! I'll take you to the back wall of my father's inner office, and you can stay there watching while I go around the long way. And use it quickly, because I'll know you're there!"

It took him three tries to find a hallway that was empty of the guards and slip out, but he was only seconds late as his father opened the door and let him in; the usual secretaries and guards were gone, and only the chief psychologist stood there, his small stock of equipment set up. But the dictator hesitated.

"Jim, I want you to know I have to do this, even though I don't know whether you have any better chance of passing it now than when you were a kid—that's just my private hunch, and the psychologist here thinks I'm wrong. But—well, something I was counting on is

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probably stolen by conspiracy, and there's a war brewing in Eurasia against us, which we're not ready for; the oligarchs have something secret that they figure will win. It's all on a private tape I'll give you. I don't know how much help you'll be, but seeing you suddenly normal will back up the bluff I'm planning, at least. We Bards have a historic destiny to maintain, and I'm counting on you to do your part. You *must* pass!"

Jimmy only half heard it. He was staring at the headpiece, looking something like a late-style woman's hat with wires leading to a little box on the table, and varicolored spools of special tape. For a second, as it clamped down over his face, he winced, but then stood it in stiff silence. In the back of his mind, something tried to make itself noticed—but as he groped for it, only a vague, uneasy feeling remained. Words, and something about a man's face.

He heard the snap of the switch, and then his mind seemed to freeze, though sounds and sights still registered. But he knew that the device in the room so far below had failed! The pressure on his brain was too familiar by description; the Bard psychi-compeller was functioning. For a second, before full impact, he tried to tear it off, but something else seemed in control of his mind, and he sat rigidly, breathing hard, but unable to stop it. His thoughts died down, became torpid, while the machine went on driving its two hundred million impulses into his brain every second, doing things that science still could not understand, but could use.

He watched stolidly as the spools were finished, one by one, until his father produced one from a safe and watched it used, then smashed it. The psychologist bent, picked up the last one, and attached it. The face of the man was familiar. "Like to have the brat in front of a burner like those we use in zombi-ing criminals."

Then something in his head seemed to slither, like feet slipping on ice. Numbed and dull of mind, he still gripped at himself, and his formerly motionless hands were clenching at the arms of the chair. Something gnawing inside, a queer distortion, that— Was this what a zombi felt, while its mind failed under education?

The psychologist bent then, removing the headset. "Get up, James Bard!" But as Jimmy still sat, surprise came over his face, masked instantly by a look of delighted relief. "So you're no zombi?"

Jim arose then, rubbing his hands across his aching forehead, and managed a smile. "No," he said quietly. "No, I'm all right. I'm *perfectly all right!* Perfectly."

"Praise be, Jimmy." The dictator relaxed slowly into his chair. "And now you know— What's the matter?"

Jim couldn't tell him of the assurance necessary to keep Aaron Bard from firing, but he held his face into a pleasant smile in spite of the pain in his head as he turned

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to face his father. He knew now—everything. Quietly, unobtrusively, all the things he hadn't known before were there, waiting for his mind to use, along with all the things he had seen and all the conversations he had spied upon in secret.

He had knowledge—and a mind trained to make the most of it. The habits of thinking he had forced upon himself were already busy with the new information; even the savage, throbbing pain couldn't stop that analytical calculating logic. Now he passed his hand across his head deliberately, and nodded to the outer office. "My head's killing me, father. Can't I use the couch out there?"

"For a few minutes, I guess. Doctor, can't you give the boy something?"

"Maybe. I'm not a medical doctor, but I can fix the pain, I think." The psychologist was abstract, but he turned out. The dictator came last, and they were out of the little room, into the larger one where no passages pierced the walls and no shot could reach him.

The smile whipped from the boy's face then, and one of his hands snapped out, lifting a small flame gun from his father's hip with almost invisible speed. It came up before the psychologist could register the emotions that might not yet have begun, and the flame washed out, blackening clothes and flesh and leaving only a limp charred body on the floor.

Jim kicked it aside. "Treason. He had a nice little tape in there, made out by two people of totally opposite views, in spite of the law against it. Supposed to burn me into a zombi. It would have, except that I'd already studied both sides pretty well, and it raised Ned for a while, even then. Here's your gun, father."

"Keep it!" The first real emotion Jim had ever seen on his father's face was there now, and it was fierce pride. "I never saw such beautiful gun work, boy! Or such a smooth job of handling a snake! Thanks be, you aren't soft and weak, as I thought. No more emotional nonsense, eh?"

"No more. I'm cured. And at the meeting of the senators you've called, maybe we'll have a surprise for them. You go on down, and I'll catch up as soon as I can get some amido-pyrene for this headache. Somehow I'll think of something to stop the impeachment they're planning."

"Impeachment? That bad? But how . . . why didn't you—"

"I did try to tell you, years ago. But though I knew every little treason plot they were cooking then, you were too busy to listen to a non-adult, and I didn't try again. Now, though, it'll be useful. See you outside assembly, unless I'm late."

He grinned mirthlessly as his father went down the hall and away from him. The look of pride in his too-heavy face wouldn't have stayed there if he'd known just how deep in treason some of the fine senator friends were. It would

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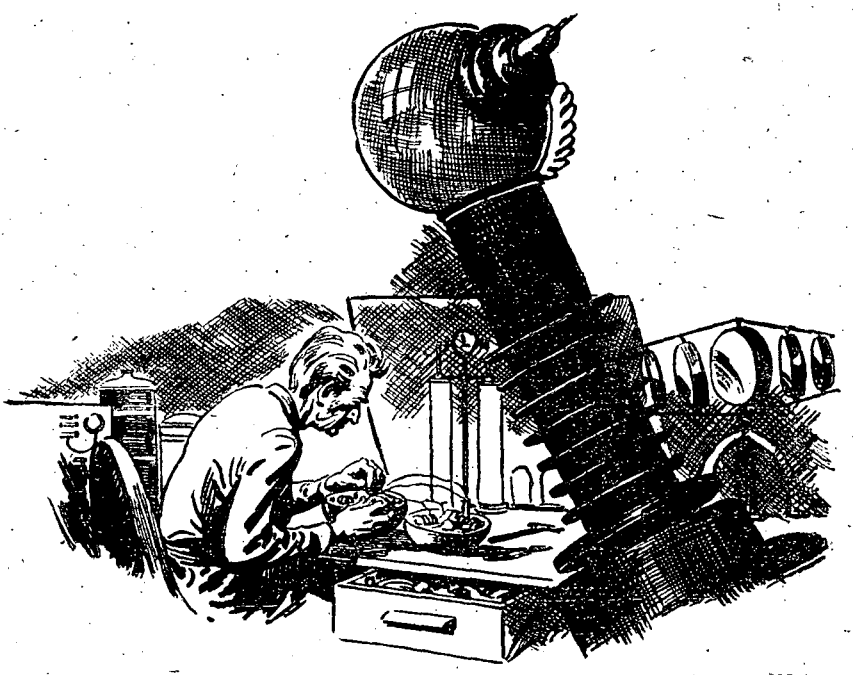

take a dozen miracles to pull them through. Jim found the panel he wanted, looked to be sure of privacy, and slipped through, racing quickly down the corridor.

But Aaron Bard wasn't to be found! For a second he debated more searching, but gave it up; there was no time, and he could locate the old man later. It wasn't important that he be found at the moment. Jim shrugged, and slipped into one of the passages that would serve as a short cut to the great assembly room. The headache was already disappearing, and he had no time to bother with it.

They were already beginning session when he arrived, even so, and he slipped quietly through the dictator's private entrance, making his way unnoticed to the huge desk, behind a jade table screen that would hide him from the senators and yet permit him to watch. He had seen other sessions before, but they had been noisy, bickering affairs, with the rival groups squabbling and shouting names. Today there was none of that. They were going through the motions, quite plainly stalling for time, and without interest in the routine. This meeting was a concerted conspiracy to depose the dictator, though only the few leaders of the groups knew that Eurasian bribery and treason were the real reasons behind it.

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It had been in the making for years, while those leaders carefully built up the ever-present little hatreds and discontents. Jim's status had been used to discredit his father, though the man's own weaknesses had been more popular in distorted versions. As Jim looked, he saw that the twelve cunning men lured to treason by promises of being made American Oligarchs, though supposedly heading rival groups, were all still absent; that explained the stalling. Something was astir, and Jim had a hunch that the psychologist's corpse would have been of no little interest to them. The two honest group leaders were in session, grim and quiet; then, as he looked, the twelve came in, one by one, from different entrances. Their faces showed no great sense of defeat.

Naturally. The dictator had no chance; he had tried to rule by dividing the now-united groups and by family prestige, and had kept afloat so long as they were not ready to strike; the methods would not stand any strain, much less this attack. He had already muffed one attack opportunity while the leaders were out. A strong man would have cut through the stalling and taken the initiative; a clever orator, schooled in the dramatics and emotions of a Webster or a Borah, might even have controlled them. But the dictator was weak, and the compeller did not produce great orators; that is incompatible with emotional immaturity.

But the dictator had finally been permitted to speak, now. He should have begun with the shock of Jim's adulthood to snap them out of their routine thoughts, built up the revival of Aaron Bard and his old atomic power work, to make them wonder, and then swept his accusations over them in short, hard blows. Instead, he was tracing the old accomplishments of the Bard family, old, familiar phrases with no meaning left in them.

Jim sat quietly; it was best that his father should learn his own weakness, here and now. He peered down to watch the leading traitor, and the expression on the man's face snapped his head around, even as his father saw the same thing, and stopped speaking.

An arm projected from the left wall, waving a dirty scrap of paper at them, and Jim recognized the dirty sheet Bard had used for his diagrams. Now the arm suddenly withdrew, to be replaced by the grinning head of Aaron Bard—but not the face Jim had seen; this one contained sheer lunacy, the teeth bared, the eyes protruding, and the muscles of the neck bunched in mad tension! As he watched, the old man emerged fully into the room and began stalking steadily down the aisles toward the dictator's desk, the atom gun in one hand centered squarely on Jim's father.

He had full attention, and no one moved to touch him as his feet marched stealthily forward, while the scrap of paper in his hand waved and fluttered. Now his voice chopped out words and seemed to hurl them outwards with physical

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force. "Treason! Barbarism! Heathen! Idolaters!"

For a second, Jim took his eyes from Bard to study his father, to spring from the chair in a frantic leap as he saw the dictator's nerve crack and his finger slip onto one of the secret tiny buttons on the desk. But the concealed weapon acted too quickly, though there was no visible blast from it. Aaron Bard uttered a single strangled sound and crumpled to the floor!

"Get back!" Jim wasted no gentleness on his father as he twisted around the desk to present the crowding senators with the shock of his presence at assembly on top of their other surprise. He bent for a quick look. "Coagulator! Who carries an illegal coagulator here? Some one of you, because this man is paralyzed by one."

Mysteriously, a doctor appeared, and nodded after a brief examination. "Coagulator, all right. His nerves are cooked from the chest down, and it's spreading. Death certain in an hour or so."

"Will he regain consciousness?"

"Hard to say. Nothing I can do, but I'll try, if someone will move him to the rest room."

Jim nodded, and stooped to pick up the scrawled bit of paper and the atom gun. He had been waiting for a chance, and now fate had given it to him. The words he must say were already planned, brief and simple to produce the impact he must achieve, while the assembly was still disorganized and uncertain; if oratory could win them, now was the time for it. With a carefully stern and accusing face, he mounted the platform behind the desk again, rapped for order, and began, pacing with words in a slow rhythm while measuring the intensity for his voice by the faces before him.

"Gentlemen, eighty years ago Aaron Bard died on the eve of a great war, trying to perfect a simple atomic release that would have shortened that war immeasurably. Tomorrow you will see in your newspapers how that man's own genius preserved his body and enabled us to revive him on this, the eve of an even grimmer war.

"Now, a few moments ago, that same man gave his life again in the service of this country, killed by the illegal coagulator of some cowardly traitor. But he did not die in vain, or before he could leave us safely to find his well-earned rest. He has left his mark on many of us; on me, by giving me the adulthood all our scientists could not; on some of you, in this piece of paper, he has left a grimmer mark—"

"You saw him emerge from a solid wall, and it was no illusion, however much he chose to dramatize his entrance; the genius that was his enabled him to discover a means to search out your treason and your conspiracy in your most secret places. You heard his cry of treason! And one among you tried to silence that cry; forgetting that written notes cannot be silenced with a coagulator.

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"Nor can you silence his last and greatest discovery, here in this weapon you saw him carry—*portable* atomic power!

"Now there will be no war; no power commit such suicide against a nation whose men shall be equipped as ours shall be. You may be sure that the traitors among you will find no reward for their treason, now. But from them, we shall have gained. We shall know the folly of our petty, foreign-inspired hatreds. We shall know the need of cleansing ourselves of the taint of such men's leadership. We shall cease trying to weaken our government and shall unite to forge new bonds of strength, instead.

"And because of that unintended good they have done us, we shall be merciful! Those who leave our shores before the stroke of midnight shall be permitted to escape; those who prefer to choose their own death by their own hands shall not be denied that right. And for the others, we shall demand and receive only the fullest measure of justice!

"In that, gentlemen, I think we can all agree."

He paused then for a brief moment, seeming to study the paper in his hand, and when he resumed, his voice was the brusque one of a man performing a distasteful task. "Twelve men—men who dealt directly with our enemies. I shall read them in the order of their importance: First, Robert Shweinende! Two days ago, at three o'clock in his secretary's

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office he met a self-termed businessman named Yamimoto Tung, though he calls himself—"

Jim went on, methodically reciting the course of the meeting, tensing inside as the seconds stretched on; much more and they would know it couldn't all come from one small sheet of paper!

But Shweinende's hand moved then, and Jim's seemed to blur over the desk top. Where the senator had been, a shaft of fire—atomic fire—seemed to hang for a second before fading out into nothing. Jim put the gun back gently, and watched eleven men get up from their seats and dart hastily away through the exits. Beside him, his father's face shone with great relief and greater pride, mixed with unbelieving wonder as he stood up awkwardly to take the place the boy was relinquishing. The job had been done, and Jimmy had the right to follow his own inclinations.

Surprisingly to him, the still figure on the couch was both conscious and sane, as the boy shut the door of the little room, leaving the doctor outside. Aaron Bard could not move his body, but his lips smiled. "Hello, Jimmy. That was the prettiest bundle of lies I've heard in a lot more than eighty years! I'm changing my saying: from now on, the one-eyed man is king, so long as he taps the ground with a cane!"

Jimmy nodded soberly, though most of the strain of the last hour was suddenly gone, torn away by the warm understanding of the older man, and relief at not having to convince him that he was still normal, in spite of his actions since education. "You were right about the compeller; it can't change character. But I thought . . . after I shot the psychiatrist— How did you know?"

"I had at least twenty minutes in which to slip back and examine my son's diary, before your education would be complete." His smile deepened, as he sucked in on the cigarette that Jimmy held to his lips, and he let the smoke eddy out gently. "It took perhaps ten minutes to learn what I wanted to know. During the war his notes are one long paean of triumph over the results on the pre-adolescents, dissatisfaction at those who were educated past twenty! And he knew the reason, as well as he always knew what he wanted to. Too much information on a young mind mires it down by sheer weight on untrained thoughts, even though it gives a false self-confidence. But the mature man with his trained mind can never be bowed down by mere information; he can use it. No, let me go on. Vindication of my compeller doesn't matter; but this is going to be your responsibility, Jimmy, and the doctor told me I'm short of time. I want to be sure. In twenty years—but that doesn't matter.

"The compeller is poison to a twelve-year-old mind, and a blessing to the adult. You can't change that overnight; but you can try, and perhaps accomplish a little. By rights I should repair the damage I helped

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cause, but I'll have to leave it to you. Be ruthless, as you were now—more ruthless than any of them. A man who fights for right and principle should be. Tap the ground with your cane! And sometimes, when none of the blind are around, you can look up and still see the stars. Now—"

"You never were insane in there?"

The old man smiled again. "Naturally. I couldn't look on and see the only one of my offspring that amounted to anything needing help without doing something, could I? I threw in everything I could, knowing you'd make something out of it. You did. And I'm not sorry, even though I wasn't exactly expecting—this. How long after my heart begins missing?"

"A minute or two!" Aaron Bard obviously wanted no sympathy, and the boy sensed it, and held back the words, hard though he found it now. Emotions were better expressed by their hands locked together than by words.

"Good. It's a clean, painless death, and I'm grateful for it. But no more revivals! Cremate me, Jimmy, and put up a simple marker—no name, just a ONE-EYED MAN!"

"*Requiescat in Pace*—A One-Eyed Man! I promise!"

The old head nodded faintly and relaxed, the smile still lingering. Jimmy swallowed a lump in his throat and stood up slowly with bowed head, while a tumult of sound came in from the great assembly hall. His father was abdicating and they were naming him dictator, of course. But he still stood there, motionless.

"Two such stones," he muttered finally. "And maybe some day I'll deserve the other."

THE END.

IN TIMES TO COME

The lead-off yarn for next month is "Pandora's Millions," by George O. Smith. It's a Venus Equilateral story—which has only one scene on Venus Equilateral, as I recollect. It starts about two minutes after the last V-E story, "Special Delivery," ends. Don Channing & Co. are coming out of the courtroom, and meet Keg Johnston, Channing's friend, and president of the Interplanetary Shipping Co. Says Keg: "You think you won?"

"I know I did!" says Channing.

"Wrong—you lost. You lost Venus Equilateral, and the whole world as we know it. Look, friend, *what are you going to use for money?* Your machine can make endless duplicates of anything."

"Pandora's Millions," you may gather, concerns the hay-wire world where no *thing* has any more value than any other *thing*—and that second thing may be a handful of dirt. Everybody has every*thing* he needs. So how do you get along? How can you—? *What do you use for money?*

THE EDITOR

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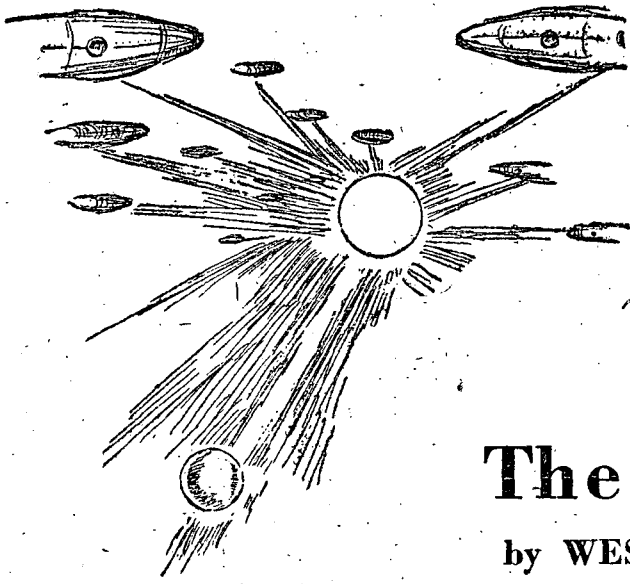

The Fixer

by WESLEY LONG

Sandra Drake was a weak reed on which to rely—but she could bring help in their crisis. They knew the cure for their plague—the exact chemical. But they couldn't make it, because one of the essential intermediates couldn't exist. Calling Earth—for help—was a project!

Illustrated by Kramer

Sandra Drake sat in her perfect apartment on Telfu, and cursed in an unladylike manner. She was plying a needle with some difficulty, and the results of her work were decidedly amateurish. But her clothing was slowly going to pieces, and there was not a good tailor in nine light-years of Sandra Drake.

The Telfan tailors didn't understand Solarian tailoring; Sandra was forced to admit that they were good—for Telfans. But for Solarians, they didn't come up to the accepted standards.

They had tried, she gave them credit for that. But the Telfan figure did not match the Solarian, especially the four-breasted female Telfan woman did not match Sandra's thin-waisted, high breasted figure. Her total lack of the Telfan skin; part feathers, part hair, but actually classifiable as neither, caused a different "hang" to the clothing. Telfans wore practically

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nothing because of the pelt and though Sandra's figure was one of those that should have been adorned in practically nothing, Telfu was not sufficiently warm to go running around in a sunsuit.

And making over Telfan clothing to fit her was out of the question. She stood half a head above their tallest women, and the only clothing that would have fit was clothing made in outsizes for extremely huge Telfan women. Needless to say this size of garment was shapeless.

Sandra finished her mending, tried on the garment and made a wry face. "I used to curse the lack of humans here," she told her image in the mirror, "but now I'm glad I'm the only one. I'd sure hate to have any of my old friends see me looking like this."

The image that repeated silently was not too far a cry from the Sandra Drake that had called the *Haywire Queen* in for a landing on Telfu some months ago. But they hadn't waited, and she now knew why. Well, she was forced to admit that her try at either trapping them here or getting off with them had failed, and therefore she had been outguessed.

That made her burn. Being outguessed by a man was something that Sandra didn't care to have happen. She could live through it; but it was the aftermath that really hurt. The Telfans came to understand her too well after that incident. They no longer looked upon her as a leading figure in her system. They knew that her knowledge of Solarian science was sketchy and incomplete. Therefore she had lost her hold upon Telfu, and was now forced to do her own mending.

On the other hand, Sandra Drake was an intelligent woman. Her contempt for the Telfan language was gone. It went on that memorable day when she discovered that everyone who understood any Terran had gone to greet the landing *Haywire Queen* and had left her unable to convey her desires. From that time on, Sandra plied herself and was quite capable of conversing in Telfan, and fluently.

So Sandra Drake had been living with the Telfans for several months. She had been forced to live with her wits and her mind and she found it interesting. Telfans were quite cold to her charms, which made her angry at times; on Terra she was used to admiration from anything masculine from fourteen to ninety-eight. Below fourteen they didn't know any better and over ninety-eight they didn't care, but the years between were aware of Sandra Drake. On Telfu, posturing, posing, and offering had no effect. They looked upon her as an encyclopedia; an animate phonograph, which, upon proper stimulation, could be made to sound interesting.

They had their machinery of action, too. Either Sandra assisted them—or she did not find things easy. It was adjustable, too, and the better assistance she gave, the better she found things.

Well, thought Sandra, it has been interesting—

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She was startled by a knock upon her door. She admitted two Telfan men and a Telfan woman. The woman she knew.

"Yes, Thuni?" she asked the woman.

"Sandrake," announced the woman, putting the Telfan pronunciation on the Terran name, "These are Orfall and Theodi, both of whom are among the leading medico-physicists of Telfu. They desire your help."

Sandra reflected quickly. After all, this ability to be of assistance did give her a sop to her vanity. The fact that as little as she really knew of Terran science she could assist, and at times direct, gave her first feeling of real self-assurance.

"I shall, if I can," she told them.

"You, in spite of your untrained mind, have been extremely valuable," Orfall said simply. "While you do not know the details, you at least have some knowledge of the channels of Terran science, and you may, and have, explained down which channel lies truth, and along which line of endeavor lies but a blank wall. That in itself is valuable."

"Another item of interest," said Theodi, "is the fact that the books left us by the *Haywire Queen* are ponderous and often obscure; they assume that we have a basic knowledge which we have not. You have been able to direct us to the proper place in them to find the proper answer to many of our questions."

"I see," said Sandra. All too seldom had anyone told her she was valuable and interesting. It had been more likely a statement of her headstrong nature, her utter uselessness, and her nuisance value.

"As you know, we of Telfu are slightly ahead of you in chemistry. Yet there are things in chemistry that can not be solved without an advanced knowledge in the gravitic spectrum that Terra has exploited. Perhaps it was the lack of a channel in the gravitic that drove us into higher chemical development; but we are planet-locked until your people return to remove the block."

"Go on," said Sandra impatiently. "I gather that you are in trouble of some sort?"

"We are, indeed. A plague of . . . ah, there is no word for it in Terran"—he switched to Telfan, "Andryorelitis," and back again to Terran—"which is an air-borne disease of the virus type. No innoculation has been discovered, and no immunity zone can be established. Telfu is in danger of halving the population."

"Bad, huh?"

"It is terrible. It strikes unknown. Its incubation period is several days, and then the victim gets the first symptoms. Nine days later, the victim is dead. Unfortunately, the victim is a carrier of andryorelitis during the incubation period, and therefore isolation is impossible."

"Sounds like real trouble to me," said Sandra. "Will examination reveal it?"

"Of course," answered Orfall. "But what planet can examine the

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population daily?"

"I see the impossibilities. Then what do you hope? We have nothing that will combat it; knowing nothing of it in Sol would preclude any possibility. What can we do?"

"To return to chemistry," said Theodi, "I will explain. Our chemico-physicists have predicted the combination of a molecule which will combat the virus selectively. It is a complex protein molecule of unstable nature—so unstable, unfortunately, that it will not permit us to compound it. We have used every catalyst in the book, and nothing works. Follow?"

"I think so," said Sandra. "What keeps it from forming?"

"As I said, it is very unstable. The atomic lattice appears to be structurally unsound. That happens in a lot of cases, you know. At any rate, we can make this molecule — and have made it successfully. But its yield is less than four ten-thousandths of one percent, and the residue precipitates out in an insoluble compound that can not be reprocessed."

"Otherwise you would keep the process going until completion?"

"Precisely. If reprocessing would work, we could leave the batch to cook until all of it went into combination. Or we could add fresh 'mix' to the processing batch and make the process continuous. But the stuff is not re-processable. We must complete each batch, and then go on a long process of fractionation to distill the proper compound out of the useless residue."

"I can see that a process of that inefficiency would be bothersome," said Sandra.

"Not bothersome, Sandrake. Impossible. Imagine going into a project giving about .000,37% yield for two hundred fifty billion Telfans. The required dose of the antibody is forty-seven milligrams. Call it fifty, for round numbers, Sandrake, and you get a total figure of one trillion, two hundred-fifty billion milligrams, or one million two hundred fifty thousand kilograms. At four ten-thousandths of one percent yield, we'd have to process something like three hundred billion kilograms of raw material and then rectify it through that long and laborious process of fractional crystallization, partial electrolysis, and fractional distillation—with a final partial crystallization. Processing that much raw material would be a lifetime job at best. Doing it under pressure, with the planning and procurement problems intensified by the certainty of the few short weeks we have . . . ah, Sandrake, it is impossible."

"What is this trouble specifically?"

"The final-addition of silicon. It will not enter the compound, but forces something less active from the combination."

"Making it useless?"

"Right."

"You've tried it?"

"And it works," nodded Orfall.

"And knowing that you of Terra have some wonders in science, we

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would like to know—"

"You see," interrupted Orfall, "they've figured that the catalyst would be less than sixty-one percent efficient, if we could combine the silicon with it and let it replace into the other compound. That would work. But again we are stuck. The catalyst is stable as it is. What has Terra done to assist in forcing combination in unstable compounds?"

"Must be something," said Sandra, thoughtfully. "May I have a moment to think?"

"Certainly."

"And one thing more. Haven't you anything that even resembles tobacco on this sterile planet?"

"I'm afraid not," said Theodi. "Believe me, we have sought it."

"Thanks," said Sandra. "I know it was for me. But, fellows, I think better with a cigarette."

"We have analyzed the one you gave us, and haven't found a similar weed—"

"O.K., I'll do my thinking in a higher plane," smiled Sandra.

A thought, fleeting as the touch of a moth's wing, crossed Sandra's mind. She fought to reclaim it. It had some association with an experience—some experience in which she had failed, somewhere.

Recently? It might have been.

Long ago?

Sandra didn't think so.

She sat there silent, and the Telfans left with a short statement to the effect that she might be able to think better alone. They would return later.

It had to do with something highly scientific; something of a nature that staggered her imagination. It was coupled with something vast, something deep, something complex.

Her eyes fastened on a spot of brilliant light, reflected from a polished and silvered glass vase at her bedside, and as she sat there with her eyes unseeing, deep in concentrated thought, her mind focused upon the one thing of vastness that she had been involved in.

Sandra's mind was good, in spite of her inferiority complex. It was sharp, retentive, and above all, imaginative. It is a point for speculation whether the imaginative qualities might not have been responsible for her antics; certainly her escapades were the result of some imaginative desire to excel. At any rate, she fastened her eyes on the spot of light, and concentrated herself into a partial self-hypnosis. The train of thought went on before her unseeing eyes with the vividness of a color moving picture, and she was not living the scene, but seeing herself live through a train of events that seemed to jump the unimportant parts like a well-planned motion picture.

Her semihypnotized mind seemed to know the right track, though Sandra's wide-awake mind either ignored the key to the problem or was not certain of the right path to follow.

She was in a room of steel. Steel and machinery and gleaming silver bars. There was some chaos

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there, too. The silver busbars had lost their die-straightness, and in one place, a single lamination of the main bus hung down askew. It was about a foot wide and one inch thick, and the nine-foot section that hung from the ceiling was slightly lower than the top of her head.

There was blood on the sharp corner, and Sandra looked down to see the red splotch on the floor. She shuddered.

Cables ran in wriggly tangles across the floor. Some were still smoking from some overload, and others, still new from their reels, were obviously part of a jury-rigged circuit. Boxes of equipment were broken open and their contents missing, though the spare parts in the boxes were intact. The whole scene spelled—

Trouble!

The floor was not level; a slight tilt made standing difficult, until a man from some other room shouted:

"The mechanograv is working—hold on!"

And the floor rotated until it was the usual, level platform. The huge busbar swung gently on its loose mooring like a ponderous, irresistible mass.

And there was a man who came striding in. His contempt for her still hurt, and Sandra winced. Even in that motion-picture dreaming, wherein the girl in the picture seemed apart from Sandra Drake, the ire vented upon the red-headed image made Sandra writhe in sympathy.

And then she heard the words come from the man's lips. They were clear and concise, and seemed to come from the man himself instead of from within her own memory:

"The electronic charge is great enough to force an inert element—xenon—to accept an additional electron in its ring-system. This permits combination with active elements such as bromine. When xenon-bromide forms, we know that our intrinsic charge is highly electronegative. See?"

The scene within Sandra's mind dissolved, and she shook her head. It cleared, but the words remained.

"Orfall," she called. "Theodi! Thuni—bring them here!"

They returned. "McBride," she said. "He can do it!"

"How?" asked Theodi skeptically.

"You've read their books," said Sandra Drake. "You know the principle of the Plutonian Lens—and also that the alternating stations require terrible electronic charges to maintain the lens that focuses Sol on Pluto. They check that with the formation of xenon-bromide for negative, and decomposition of tetrachloro dibromo-methane for the positive charge. They can do it."

"Can't they do it a-planet?" asked Orfall sadly.

"Not unless they can raise the whole planet to a high negative charge," snapped Sandra. "What do you think?"

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"I don't know—none of us do. Can they?"

"No."

"Then—?"

"We'll call them, tell McBride what's the matter and what we need. He'll fix it."

"It sounds like a fool's gesture to me," said Theodi.

"Utterly impossible. How are we going to get in touch with them in the first place?"

"Look," said Theodi. "We can call them. See what McBride says and put the problem to them. If there's a way out, fine. If not, we've lost nothing."

"But how are we going to call them over nine light-years of space?"

"Ah—yes," said Theodi. "We can't."

"Maybe I can," said Sandra. "That'll be my contribution. I think I can call them."

"Nine light-years—" objected Theodi.

"Remember that the gravitic spectrum propagates at the speed of light raised to the 2.71828 . . . th power. That'll make talking to Terra like calling across the room. May I try?"

"You think they'll be listening for you?"

"Can't miss," said Sandra with a positive gesture. "My ship, the *Lady Luck*, is equipped with the standard communications set. It puts out right in the middle of the main communications band of the electrogravitic. If I can get enough power to beam towards Sol, it'll hit them right in the middle."

"You intend to use the set in the *Lady Luck?*"

"Overloaded to the utmost. They tell me that they'll take one hundred percent overloads for an hour. Make that one thousand percent, and it may last ten minutes. Ten minutes is all I need to give them our trouble—they have recorders if McBride isn't there to hear it in person."

"Where are you going to get that power?" asked Theodi.

"From you."

"Impossible, Sandrake. You know that there is not sufficient power available to make such a program possible."

"Ridiculous. The resources of a planet are unmeasurable."

"Perhaps so," said Theodi. "But remember that our power, like Terra's power, is spread out all over the face. The transmission of power such as you will require would be impossible because the line losses will be greater than the power input. It might be possible to connect the networks together and draw the entire power output of Telfu into one district, but line losses would prohibit its operation."

"I only need ten minutes maximum," said Sandra.

"You're asking us to sacrifice—? You mean—overload every plant within efficiency-distance of your ship until it breaks down?"

"What have you to lose?"

"Can we do it?" asked Orfall.

"Of course," said Sandra. "You run your machinery at low load until it is running at ten times the

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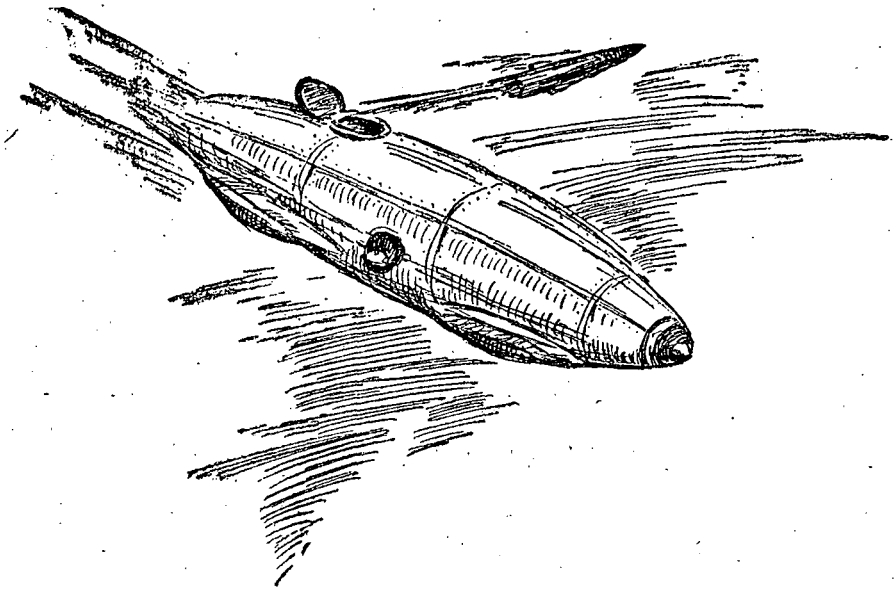

velocity, and then I cram on the power. Momentum will carry me through."

"And if one machine goes, under that load, the entire district will go completely dead."

"Oh no," said Sandra. "The closer and most powerful one will not be used. That one will be used to talk to the boys when they arrive. They'll only have a distress signal, and the details must be held until they come investigating. They can't land, and so we'll have to tell 'em the story while they're in space. We'll need that power."

"Small consolation. Then Indilee will be an oasis of power in a radius of powerless country."

Sandra looked Theodi in the eye and said in a cold voice:

"Then go on out and die with the rest of your kind. What good will your machinery do you if you're all dead?"

"This is a democracy, Sandrake. We cannot just take the machinery and the equipment of others—even to save ourselves."

"How's your red tape factory?" she asked with a smile.

"Meaning?"

"Either you get those power plants or die. I don't care if you steal them, buy them, or borrow them. But get them—and quick."

"But there is a chance to save Telfu," suggested Orfall.

"Sensible fellow," smiled Sandra. In her mind she cursed the whole planet. This was a place for Sandra to undulate a bit; to turn on those two-million kilovolt-ampere eyes; to stretch one rounded arm

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out straight, putting the other hand below the ear and raising the elbow to a level just above those eyes and shielding the victim from the warmth in them. This showed off Sandra's svelte figure to perfection, and few men in Sol could have refused Sandra anything after that perfect performance.

But they were very few.

The Telfan ideal of beauty did not include Sandra Drake's perfection. She could have postured from now until galaxy's end, and they wouldn't have known her intent. Against their women, Sandra was alien—not sickeningly ugly or deformed, but alien and acceptable—and totally undesirable.

Sandra sighed, told the subconscious mind not to bother with the spotlights and provocative sultriness, and tried to think her way to the mastery of these Telfans.

"Couldn't we divert the electrical supply plants across Telfu?" objected Theodi. "Seems to me—"

"Not a chance," said Sandra. "You have no idea of the power required. I must shoot the works all at once. The set, the generators, and the supply lines will all go out at once. That'll give me ten minutes, I hope."

"But the dissipation of such power— Where can we collect it?"

"There's only one place on Telfu. That's in the power room of the *Lady Luck*. That is still intact?"

"Yes. Handled, inspected, photographed, and manipulated without driving power, of course, but it is still intact."

"Should be," commented Sandra wryly. "After all, my trouble was not being able to make the drive work. Couldn't get any push. Used up my entire stock of cupralum. So, do we?"

"I hate to say 'yes,'" said Theodi.

"Look," said Sandra, realizing something for the first time. "We have lots of gravitic machinery. Give me your useless power plants and I'll see that you get gravitic machinery to replace them."

"Um-m-m."

"Look, Theodi, you're used to thinking in Telfan terms—which means no gravitics. Think in Terran terms. You are no longer alone in the universe. You are in contact with a race that has gravitic power."

"Well—"

Sandra smiled. "Take it or leave it—and die," she told him. "Think of it. Andryorelitis comes like a thief in the night, giving no warning. Like the black wings of a gigantic, clutching bat, silent and ominous and unseen it comes and spreads its horde of hell on the city. Men go on in their way, meeting other men and inoculating them, passing the germ of death to whomever the black visitor may have missed on his visit. Men take it to their families and spread it from hand to hand, from lip to lip, from mother to babe to grandparent and beyond. The unborn is as cursed as the almost-dead, for it is within their bodies. The days

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pass in which every soul is given the opportunity of catching and spreading the dread disease.

"Then in this peaceful, unawareness of the terror, nine days pass and one sees a red spot on his arm. He shies away from his friends not knowing that they, too, have red blotches. The city is made of slinking men, ashamed women, and scared children. The newspaper headlines scream of the plague, but none will buy, for they fear inoculation on the part of the newsboy. They fight and fear one another, and the plague has its way, spreading across the city like the falling of night and missing none.

"The Grim Reaper swings his sharp scythe, and the populace falls like shorn wheat.

"And the stricken city becomes a place of horror. The smell of rotting bodies taints the air and makes life impossible for those unlucky few who have not been given the peace of death. None are interested in the cries of the dying, and no one sees the sunken cheeks, the withered bodies, the redding flesh. Do you like that picture, Theodi?"

"You speak harshly, Sandrake."

"You paint a prettier one," said Sandra, scorning him. "Go home and dream. Let your imagination roam—or haven't you Telfans got imagination?"

"We have, but—"

"You utter fool! To stand there like a stick of wood between Telfu and some lumps of worthless metal! Like the drowning man that clutched his gold—which pulled him under. Fool's gold, Theodi."

"There is much in what she says, Theodi," added Orfall.

"It is hard to think, sometimes," said Theodi slowly.

"Men!" sneered Sandra. "The whole sex is the same, here or on any inhabited planet. You know so much! Your vaunted power of reasoning is so brilliant. You pride yourselves on your inflexible wills or your willingness to accept new ideas, depending upon which your utter self-esteem thinks is best to exhibit at the instant. Thuni, what do you think?"

"The metal is of little importance to dead men," said Tuni promptly. "And you claim that Terra and Pluto have machines in abundance. The answer is obvious."

"You see?" said Sandra triumphantly.

"I've forgotten," admitted Theodi. "I'd been taught from childhood that high power was hard to get. It is hard to think that another star has it a-plenty and is willing, and able, to give us enough for our needs. It is a revolutionary thought and seems unreal. A story, perhaps. Yes, Sandrake, you shall have your power."

"Good," said Sandra, taking a deep breath. "And thanks. I'll also need your best students for the job."

"Our best are poor enough. Gravitics were known in theory only. A detectable phenomenon, utterly useless. We could not pass the initial doorway—the power generating bands—because of our satellite's absorption of the primary effects. To study the higher and

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more complex effects was impossible save in theory. But you shall have them."

"I have some practical working knowledge of the stuff," said Sandra. "One can't live and work with McBride and Hammond and the rest without getting a bit of it. Oh, I was only with them for a few weeks at best, but they are ardent teachers. I'll get along with the help of your students."

"You're certain?"

"Not certain—but fairly sure. At best, you have nothing to lose and everything to gain."

"I think we have misjudged you," said Theodi. "You're fundamentally fine—"

"Thank you," said Sandra, simply. "Convincing you was the hardest job I've ever done, believe me."

"Convincing the Terrans—?"

"Will be the second hardest job. Darn it, we can't use television."

McBride shook his head at Steve Hammond. "Don't believe it," he said.

"You don't."

"No, I don't. Drake has something up her sleeve."

"It's a pretty big sleeve, then," grinned Hammond. "Rigging anything to call from Telfu to Sol is no small potatoes."

"She overloaded everything in sight. That'd about make it right," said McBride. "It went blooey right in the middle of the third sentence—'McBride or Hammond: Telfu in grip of serious epidemic. Need highly charged laboratory to prepare mis-valenced compound for synthetic serum. Danger is imminent, so implore your help for the lives of—' and that's all. Either she's as dramatic as Shakespeare, or this is the real juice."

"And you think it is joy-juice."

"Her past record—and yet we can't afford to pass this up. She should know, though, that if this is the malarkey, she'll be scorned out of the system. Both systems."

"She wrecked the lens—and she's still here," reminded Hammond.

"'Here' is right," said the pilot cheerfully. "In case you birds are wondering about our position, Telfu is right below us by ten million miles."

"Suppose she's got anything left of that set?" asked McBride.

"Imagine so. The thing couldn't have gone to pieces like the Wonderful One Horse Shay. Give a call and see. If Sandra's not kidding, she'll be listening."

"Kidding or not," laughed McBride, "Sandra will be listening."

Hammond turned on the communications set and coughed into the microphone, watching the meters swing. Then, satisfied, he said: "This is the *Haywire Queen* answering S. D. I. from Telfu. Calling Sandra Drake. If you are listening, break in. This is Hammond of the *Haywire Queen* listening for a repeat of previous S. D. I." Hammond broke into Telfan and repeated the message.

Then the answer-light winked on the panel and he heard:

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"This is Sandra Drake. Is it really you?"

"No," said Hammond. "Just a reasonable facsimile. What's the matter?"

"Oh!" said Sandra. There was a world of feeling in the word. "This has been the longest seven days in my life. It worked, then."

"What worked then?"

"The communications set."

"Obviously. What did you do to it?"

"Not much, personally. I sort of managered it, though. They lent me their best gravitic students and we went to work on the thing. We remade everything in the set—everything that could stand it, that is—about four times their size. That's where I came in. Some things couldn't be increased in size without ruining the tuning, and I knew which ones. Is my output all right?"

"Shaky, but strong enough for service."

"I'm running without an output stage. We used the output stage to drive a super-power stage made of the beefed-up parts and when the works went blooey, it took the Telfan output and my output with it. I'm running off to my own driver stage."

"You've been a busy little girl," said Hammond. "What did you use for power?"

"I talked them into giving me every power plant in the district so that I could call you. It all went in eight minutes flat. The *Lady Luck* is a mess—again."

"Are you brave or foolish?" asked Hammond.

"Both," answered Sandra. "After all, this is no tea party. There isn't a good generator on the *Lady Luck;* I ruined them all trying to call you. Can you understand how urgent this is?"

"I think so," said Hammond. "How did you wreck the whole shooting-match?"

"I used the gravitic generators to generate local fields and used 'em as communications-band reflectors. Part of it was theory on the part of the Telfans and part of it was ideas given me by your experiments with the super-drive. Anyhow, I'll bet that Soaky is fifty degrees hotter, now, with all the soup we put into the transmitter. That'll make your problem easier—hey?"

"Yup," smiled Hammond. "Just like the guy whose only reason for sending telegrams was that he hated to see the mail-carrier work so hard."

"Well, fifty degrees is one percent of the way, anyway."

"That's right," grinned Hammond. "But look, we're killing valuable time if this is as important as it sounds. What's needed?"

Sandra explained.

"And you say the silicon won't combine? Shucks, we can do that all right," said John McBride.

"Fine."

"Our problem is delivering the goods."

"Why?"

"Name me a container that will

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carry the electronic charge."

"Oh? I was thinking—"

"Don't bother," said McBride. "There isn't anything better than ten million miles of pure and absolute space. She'll corona, and then arc, and then she'll assume the normal charge and the stuff will come unstuck again. And you couldn't possibly send every Telfan out into space for a treatment. There aren't enough years in a century to do that."

"First, we'll have to do away with Soaky," said Hammond.

"We can do that," said McBride. "The converted spacecraft are about ready. We can get 'em off in twenty-four hours. But landing this compound is the tricky job. How are we going to do it?"

"Let's assume that we can think of something and get the rest of this yarn. How do you feel, Sandra?"

"Tired, sort of. I've been busy."

"I gather."

"But this slight relaxation is doing me a lot of good. Is the Lady Thani with you? Her sister, Thuni, asked me to ask."

"She and her husband are on Terra. We didn't pass that way. But you may tell Thuni that they are well, happy, and being treated with Terra's best. Our main trouble is shooing away vaudeville agents, flesh merchants, and screwball politicians who either want to tie their wagon on behind or run their wagon up against."

"You'll never get rid of them," said Sandra. "Are they pointing with pride or viewing with alarm?"

"The pointers-with-pride hold a very slight majority."

"That's a fair sign."

"You're right. It is. Luckily, most of the newspapers follow the pointers-with-pride and the general feeling is that way. Most of the malcontents fear that Telfu will have a finger in the division of the universe and they are not going to get as much because of it. They think we should step in and run Telfu, or Telfu may step in and run us."

"We're far enough apart to save 'em the trouble," said Sandra. "But look, fellows, you're running back to Terra—or Sol, anyway. Can you bring me something the next time you come? Please?"

"If possible," said Hammond.

"I need cigarettes, and clothing. I look seedy. I'm frantic for a smoke; I know where you can buy a corpus delectable, dressed in old clothing, for a pack of smokes."

"Willing to sell your body for a mess of potash?"

"Just about. But remember the old one—*Caveat Emptor!*"

"Knowing you—I'll remember," laughed Hammond. "How have you enjoyed your visit?"

"So-so. It's been an experience. A lonely experience, believe me. I've had my troubles, and I've had my triumph. Aside from the complete lack of human companionship, it's been interesting enough."

"You mean male adoration?"

"Might as well admit it," said Sandra. "These birds look upon me as they might view one of those

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platter-lipped Ubangis. I'm not interesting nor disgustingly repulsive. Here I am, and I'd have been washing floors for a living if it hadn't been for the fact that I do have some experience and knowledge in gravitics. At least, I know where to find the answer."

"Well, take it easy, Sandra, and we'll be back. Look, I'm dropping a message-carrier with a radio spotter in it. It'll carry all of our spare cigarettes. Can't do much about clothing. None of us wear lace undies."

"I'll bear up," answered Sandra with a laugh. "Thanks."

"O.K., then, see you later."

"Right," said Sandra. "So long!" the set died, but before it went completely off, they heard her say to someone in the background: "You can turn the lights on again."

"What did she mean by that?" asked Hammond.

"I'll bet a cooky that they had the entire output of some city diverted into her communications set. After all, what with Soaky's absorption plus the normal power-gravitic communication, they'd do a lot of running on a waterfall plant, or a coal burning plant to make up for what we accomplish with a single machine in Sol. Our power took a beating, as far as we are from it, and we know what kind of power it takes to do anything with the gravitics on Telfu. Well, let's get going. This seems to be the beginning of Our Busy Week."

At Hellsport, on Pluto, twenty-four huge ships were grouped. They looked like the Devil's spawn; their upright ovoid shapes set in the glimmering background of the light that danced from the open-hearth furnaces of Mephisto. In the sky, the reflection glowed, and it was known for hundreds of miles as The Eternal Fire.

But the men that were arriving were too busy to notice the picture it presented. They were too close to that scene, although they had seen the photographs in the *News From Hell* and *Sharon's Post,* where almost identical pictures filled a whole page in the roto-gravure sections.

They kept arriving, these men who were going to Sirius to set up another Lens. They came from resorts on the Sulphur Sea near Hell and they all asked the reason. They came from Sharon, which lies across the River Styx from Hell, and they asked the same question. The hurried call sought men from their play-spots in the Devil's Mountains and from the vacation wonderlands of the Nergal Canyon. The Great Cave of Loki in the Æsir Plains lost a dozen or so, and Fafnir's Abyss no longer rang to the click of camera shutters as the group left for Hellsport. Vulcan, the frustrated volcano, felt the downward-moving footsteps of the seven who were studying the embryonic crater that was beginning to show signs of life under the heat of Pluto's synthetic sun; the men left eagerly to be on their way to Sirius, but they all prayed that the

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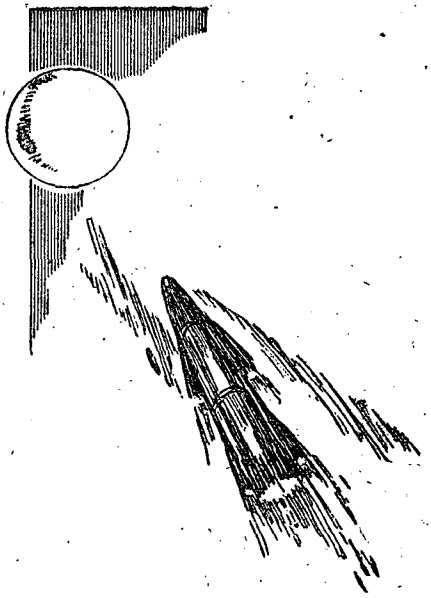

cold of Pluto's interior would remain cold until they returned.

The Hall of the Mountain King rang to their laughter as they returned to their hotel accommodations near Hellsport, and then again was silent as they went to Hellsport and made the last finishing touches on their equipment.

Just before take-off time, the old familiar cry of "Where's Carlson?" went the rounds until Carlson himself took up the general communicator microphone and called "Here, dammit!" and was informed that it was good because they couldn't start the lens without him. That cooled Carlson off, because it was true and all of them knew it.

Then the two dozen mighty ships lifted in the air above Pluto and headed for Sirius. They joined the *Haywire Queen* on her way from the Plutonian Lens, and after a few minutes of discussion—all done while accelerating at one hundred and fifty feet per second per second per second—they fell silent and started on the run to Sirius, nine light-years away.

The trip was made without mishap.

"Now," said McBride, through the general communicator, "in order that we understand, I'm going to repeat the general plan again.

"This is a problem different from the central heating system. We are not going to make a planet livable —*we are going to destroy it!* Honestly, it is but a satellite, but the problem is only made more difficult since it is harder to hit with a stellar beam. But enough of that, we've got the calculations necessary.

"We intend to burn Soaky. Our trick, then, is to set up the maximum possible heat-energy field around or on Soaky. Therefore a lens-system such as the Plutonian Lens is out of the question. Far better is a duplex system. We shall, therefore, send twelve of our ships to a point in space less than thirty million miles from Sirius. This will give us a solid-angle of considerable magnitude—a power intake, if you will—that will extract about all that we can handle.

"The front lens-element will cause the divergent rays from Sirius to become parallel or nearly so. We can't help but lose some.

"Now these parallel rays will hit

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the second element, which will be set up less than ten million miles from Telfu. That's about as close as we can get without losing our control due to Soaky's field-absorption. And it will focus the entire possible bundle of energy on Soaky. Unless Soaky is utterly impossible, we'll cook his goose. Right?"

The answer came with a laugh. Then someone asked about Soaky.

"Soaky," continued McBride, "is a satellite of Telfu. It is approximately one quarter million miles from the planet, and is invisible from Telfu, being less than a hundred miles in diameter. The Telfans, by means of crude gravitic detectors, have discovered Soaky plotted his orbit pretty well, and so we really have little to do."

Steve Hammond went to the microphone and laughed. "McBride is a master at the art of understatement," he said. "But my contribution to the art of eliminating planets is an anachronism. We have, on the *Haywire Queen*, one of the most useless things in the universe. I shudder to mention it, fellows, but there must be some good place for everything, no matter how useless it may seem. We—and hold your hats—have a rocket ship."

A series of groans and catcalls returned over the communicator, and there was the shrill whistle of someone outrageously murdering *"La Miserere."*

"Yep," continued Hammond, "Skyways, who boast that they can furnish transportation anywhere within reason or realm of operating practice, have furnished the *Pyromaniac*, which, named, appropriately, may operate on or near Soaky. It is a useless bit of machinery for anything else, and once the *Pyromaniac* has landed on Soaky and planted spotter generators for us to get a precise 'fix' on, the *Pyromaniac* will be relegated to some museum—if she doesn't get scuttled on the way in."

At this point McBride returned and finished by saying: "We shall set up our lens, and exceeding Archimedes, 'Having a place to stand, we shall burn up a satellite.' So now go on and make the thing cook, fellows. You all have your orders. The *Haywire Queen* will be a roving factor, feel free to call us for any trouble. We've got our own job cut out for us."

The twenty-four great ships of space, already spread out across the space between Sirius I and Telfu, began to jockey for their selected positions in space. McBride listened to the quick-running patter of the lens-technicians and the astrogators as they juggled their ships into the first semblance of order. Then he turned and nodded to Larry Timkins. Larry shook his head and left, going aloft to the rocket ship.

The loft opened and the *Pyromaniac* diverged from the opening. Hannigan, the *Haywire Queen's* regular pilot, snapped the switches briefly and the *Queen* darted away from the free-running *Pyromaniac* for several miles. Then the first

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burst of flame came searing out in a mushroom, which lengthened to a long rapier of white fire. The *Pyromaniac* moved off ponderously, and the sky was cut into two parts by the river of flame that burned in the rocket's jets. The rapier of flame curved slightly and pointed toward Telfu.

"No worrying about him," said McBride. "We'll know where he is."

"So will the rest of the system. O.K., Jawn, you've got the boys running—now for our problem. How do we make Silicon-acetyldiethyl-sulfanomid?"

"Yeah. How?"

"Well, according to La Drake, their trouble is the lack of stability. We can probably make it under high electronic charge—in fact, that's what she was suggesting."

"What'll it do when we remove the intrinsic charge? Remember the xenon-bromide. It falls apart when we leave the high negative."

"It's more than likely that the stuff will collapse when we neutralize."

"Do you suppose we could get it there before it falls apart?"

"You mean like the guy who used to put the light switch off and get into bed before it got dark?" laughed McBride. "What would happen to our xenon-bromide if we were to get it to zero charge all at once?"

"I don't know, but file that one away for future reference," said Hammond, thoughtfully. "Make up a batch of xenon krypto-neide, or any of that ilk which might be crystalline, and then heave it in an electrostatically charged shell at the enemy. Upon neutralization, what with the hellish electronic charge plus the reversion to gas—probably white-hot from electrical discharges—we'd have an explosive that would really be good."

"Good!" exploded McBride. "Look, my little munitions expert, the neutralizing charge—happening instantaneously—would paralyze everything electronic in nature for seventy miles-even in space, and the electronic charge, reaching zero in nothing flat, would cause instantaneous decomposition of the compound. Since it is held together electrically, the decomposition, or *burning* rate, would propagate at the speed of light, or approaching that velocity. *Whoooo.* Blooey for everything in sight!"

"Funny how the human animal can always dream up a scheme for something lethal out of every invention."

"Yeah—even while they're trying to figure out something to save a planetful of people, they'll invent something deadly. That's one of the things that makes us *us*. But what do we do with the Telfans?"

Theodi says it is stable once made—do you suppose it would be stable even if made in the forced process?"

"Let's try. Got the stuff?"

"Barrels of it," said McBride. He went to the shelves of bottles and removed the ingredients for Telfu's antibody. He weighed the chemicals, and placed them in a combustion boat. This he placed

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under a cover-glass and then called for Hannigan to run the intrinsic-charge generator.

As the collectors began to load the ship with electrons, and the various chemical indicators began to change color at various levels of charge, McBride and Hammond set up long-focus microscopes to watch the compound.

The final tube on the indicator panel changed from the mixture of xenon and bromine to a gray-green gas, and then McBride called: "Enough, Hannigan."

"Right, boss," said Hannigan.

"Any action?"

"Not yet. First the atmosphere of pure nothing so the stuff won't try to combine with the aforemention atmosphere. Then twelve hundred degrees Kelvin, and finally the slow-cooling to form large crystals." McBride opened a valve and the trapped air under the sealed glass whipped out into space. "This stuff is stubborn," he added, turning on the heater. The mixture grayed a bit, and then started to turn cherry red all over at once. Hammond manipulated the color-temperature meter and when the color was right, he motioned and McBride cut the heater, riding the control all the way to room temperature.

"Anything?"

"Won't form."

"Huh?" asked Hammond. "I thought we could form anything."

"We can. But we might not live to tell about it. Some items of unstable planetary systems are easily converted from their normal valence-ratings to others of wide and ridiculous values. We picked xenon for our final indicator because it fits in nice with the negative value we need. But this stuff has valence-inertia beyond that value. According to this stuff here, I'd say that its instability was less than that of the carbon-chains that go into the human body."

Hammond whistled.

"And that means, little brother, that by the time we hit the right negative charge to make this stuff combine, we'll end up with being completely and irreplaceably dead."

"Ugh!" grunted Hammond. "Did we get anything?"

"Can't tell," said McBride. "Darned stuff sets like cement when it cools. Warm up the tensile strength machine and we'll crush it and paw through the wreckage."

He inspected the crushed mass a few minutes later and managed to separate two minute crystalline specks under the microscope. "I don't know whether these are the stuff, Steve," he said, "or whether it is just wishful thinking. Is it better than that four ten thousands of one percent yield?"

"Not if you can weigh it. We started off with a hundred grams. One percent is one gram; four ten-thousandths of one gram is four hundred micrograms. The balance will swing over on less than ten micrograms. This isn't even that much. No good, Mac."

"Call Theodi and ask about that

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catalyst-conversion stunt."

"Huh?"

"He intimated that if they could combine the silicon with the catalyst, they'd be able to cause metathesis at better than sixty-one percent efficient. Trick is getting silicon to combine with an already-filled compound."

"They are better at chemistry than we," admitted Hammond. "I'll call."

Apparently the receiver in the *Lady Luck* was attended constantly, for the sleepy voice of a Telfan answered. He answered that he would get Theodi, and as he was about to shut off the transmitter, another voice came over. It was Thuni.

"Hello, Thuni," said Hammond cheerfully. "How goes it?"

"Bad," said the woman. "But I must go."

"I wouldn't," advised Steve. "Your sister Thani and her husband would like to talk to you."

"Oh," said Thuni in a strained voice. "I'd like to speak, too. But this expenditure of power . . . I fear—"

"Nonsense. Thani has been nine light-years away for almost a year. Think, Thuni, the light that started from our star is only one ninth of the distance on the way, and Thani has been there and back."

"I know, but this power—"

"What's power?" laughed Hammond. "We've plenty of power."

"But we have not. Realize that the entire city of Indilee is in darkness because of my desire to speak."

"So what?" asked Hammond. "You have the chance, have you not?"

"But I am not Sandrake, who would think nothing of expending the entire power-availability of a whole city just to talk."

"Sandra is pretty much a human being in spite of her faults," said Hammond. "I'm certain that any of us would have done it, just in the same manner. In fact, I'm not too certain that Drake is inclined to be a little inefficient, not knowing too much about the finer points of operation. *I'd* probably divert the power output of the whole planet just to be sure I was heard."

"Does nothing stop Terrans?"

"Not for long," laughed Hammond. "And here's Thani. And the operator won't be asking for another thirty thousand dollars after the first three minutes, because there's no operator."

"I fear," started Thuni, and then ceased her worry. She finished: "I'll hold this open until Theodi comes, at least."

"Good. That's learning to use the gifts of the universe to your own comfort and pleasure. See you later, Thuni." To Thani, standing at his side, he said: "Here's your sister. She needs cheering up."

Thani flashed him a smile that might have been enticing in a Terran woman, and then turned to talk to her sister.

"Meanwhile," said McBride, "I've a thought. Not a good one, but a couple of dark ones. We

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know that silicon is a tough character. It doesn't take to planetary changes with the ease of xenon, for instance. It is way high up on the electronic-stability table."

"That's correct," said Hammond. "But we've been thinking in terms of not trying to add the silicon, but to combine the sulphur to the rest of the compound containing the silicon already."

"Frankly, not too much is known about the electro-combining processes with the more complex organic compounds. But what I'm thinking is this: A chain is as strong as its weakest link, and the attempt to add silicon to the compound only fails. When the more active sulphur is added, it automatically forces the silicon out of the compound, and will continue to do so until the right electro-negative charge is reached. Electro-combining silicon at a level less than its electro-stability level is impossible."

"That means trouble, Mac," said Hammond slowly. "Want to try the decomposition of silicon-fluoride?"

"Might, to kill some time." McBride reacted fluorine with silicon in a combustion chamber and then called for Hannigan to run the charge down again. They watched, and as they expected, nothing happened.

"That's it," said McBride. "We're stumped."

"I wonder—" mused Hammond.

"Have you any doubt? Are you thinking of automatically operated space-chambers set up for the formation of Silicon-acetyldiethyl-sulfanomid?"

"That might work if we had time to build 'em. But look, Mac. Suppose we generate a terrific electrogravitic field, monopolar as according to the first orders of gravitic fields. Generate this field in a volume of less than a foot in diameter, and accordingly intense. Then we'll negatize the ship, and at the same time bombard the electrogravitic sphere with electrons from a standard electron-gun. It'll take gobs of power, John, to drive 'em in, but the field will help, and also keep 'em there. What do you think?"

"Sort of localizing our collection of electrons, hey? Hm-m-m. We'll have to do that in vacuuo—but that'll keep the atmosphere from combining, too, and is better as she goes. We have plenty of electrons when the ship runs negative, and that'll tend to collect them in the place where they're needed the most. Might work, Steve. Break out the E-grav and we'll try."

Hammond called Pete Thurman and James Wilson and told them what he wanted. They all set to work, but an interruption came for Hammond and Hannigan as the *Pyromaniac* returned in a blaze of fire.

The rocket went off, and the *Haywire Queen's* pilot did some fancy work until the inert rocket ship entered the space lock above. Larry Timkins emerged, holding his head between his hands. "It's

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murder," he said. "Downright murder!"

"What's murder?"

"Manipulating that fire-breathing gargoyle. Y'know how the regular drive takes hold all at once? Well, this thing sort of hangs fire. There's a bit of a lag—ever so little—since the jets are sheer mechanical and the time-function requires that the mechanical linkages from lever-turn to fuel-release, ignition, and ultimate movement—well, they act in considerably less time than the electrogravitic drive."

"Do you have to use it again?"

"Nope. I planted the spotter-generators and—picked up a souvenir of Soaky. Look," and he pulled a piece of crystal from his space-suit pouch and dropped it on the table.

"Dirty looking hunk of glass," said Hammond. "Going to use it for a paperweight?"

"It'd go better on the gal friend's finger, but I'm going to sell it and lay away the profits for my edification and amusement. It'll assay four karats if it's worth a dime, and that ain't quartz."

"Diamond?" asked Hammond in surprise.

"It has an index of refraction higher than 2.4, and is harder than Sandra Drake's heart."

"Sounds like. How did it get there?"

"Ask the bird that dropped it. I only picked it up. If I'd found it in a blue-clay flue, I'd have mined Soaky for fair, but a loose diamond lying on the surface is strictly a changeling. Soaky must have known high-falutin' friends in his younger and more promising days. Call it one of those inexplicable mysteries and forget it. I give up."

"Hm-m-m. Might be more there, hey?"

"Yeah, but the life of Telfu depends upon our getting rid of Soaky."

Thani, who heard the latter part of the discussion, came over and looked at the uncut stone in wonder. "You will want to inspect our satellite?" she asked Hammond.

"I'd like to," he said. "But we have no time. While we've never synthesized anything larger than fractional-karat diamonds, and this four to five karats worth of crystallized carbon will be worth a small fortune to Timkins, here, the idea of forestalling help to Telfu whilst we chase a will-o-the-wisp is strictly a phony. Besides, it looks to us as though this one was a sport—an impossible find. Chances are that Larry was extremely lucky."

Thani shook her head. The chances of a huge fortune in precious stones going up the chimney because of danger to an alien race gave her food for thought.

McBride's shout cut all future conversation along this line. Hammond called for Larry to follow, and they went to the room in which the electrogravitic generator was being worked on.

McBride met them. "We're about ready," he said. "There's peepholes for all."

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"Peepholes?"

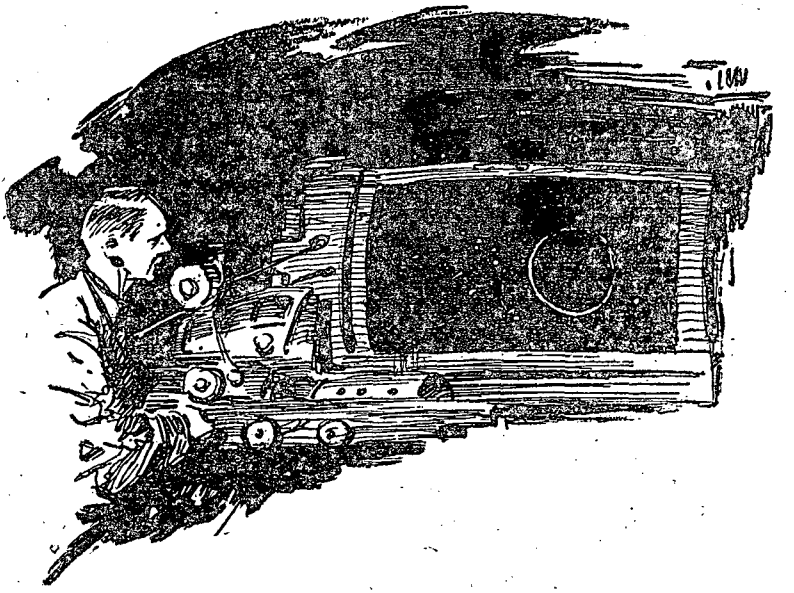
"Unless you want to be in an airless room along with umpty-gewhillion electron volts. Better take a peephole."

McBride's hole was equipped with telescope and controls for the equipment. They set their eyes to the windows and watched. McBride explained: "First off, I open the space cock and let the vacuum of space in. Said vacuum drives the air out, leaving the place filled with hard nothing. That eliminates the possibility of corona with the voltages we are going to use."

Then he depressed the generator-on control button, and the pilot lights winked. He read the meters through the telescope, and adjusted the variable controls until a faintly outlined sphere formed between the radiator gravitodes of the generator. This sphere was invisible in that it reflected no light and was transparent, but the light from the wall beyond was refracted slightly, and the sphere was constantly changing in index of refraction, so that the sphere shimmered like heat waves over a meadow.

"We set the spherical warp, so. Now on the boom we insert the combustion tube containing the mix. The insertion of the boom is easy due to the heavy gravitic field, which attracts proportional to the square of the distance. I think it increases the inertia-constant—"

"*Woah,* Mac. Inertia is a



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property of matter, not a phenomenon."

"You can stir up a good argument later, here or at the annual meeting of the Gravitic Society. Right now I'm about to turn on the heat." McBride withdrew the boom, leaving the combustion tube in the warp, where it was fixed against the infinitesimal point of zero-attraction, with all sides of the boat in contracting-urge. He snapped the button and watched through the color-temperature meter. Then, as the color was reached, he threw over a series of controls, and the spherical field became a riot of color.

It fluoresced, as the bombardment of electrons hit it, coming from all sides. The sphere grew, and McBride tightened the warp by applying more power. Still it grew as the repulsion of the electrons tried to nullify the gravitic attraction, and McBride continued to step up the power of the electrogravitic generator to keep the sphere from expanding.

"Hannigan," he called. "Give me just a bit more?"

"We can stand about six more electrons," laughed Hannigan. "No more."

"Give 'em to me," returned McBride cheerfully.

And then the sphere refused to be confined. It grew, and McBride made comic motions with the hand that held the control, as if to turn the knob from its shaft in a supreme effort to increase the power by a single alphon.

The sphere grew to huge proportions, and McBride cranked the control to zero just as the surface of the sphere grew instable and threatened to expand without limit.

His other hand turned the heat control slowly down, and the color of the combustion tube died. A hiss of air entered, and they ran inside to see the result.

The combustion boat was ablaze with scintillating crystals. Beautiful blue-green crystals that were half-hidden in the gray-yellow powder of the catalyst. Their surfaces caught the lights, and sent little darting spots of blue fire dancing over the approaching people.

McBride lifted the combustion tube with a pair of tongs. "This is the pure stuff," he said quietly. "Looks like a good crop this year, too. What's it insoluble in, Steve?"

"Sulphur dioxide," according to Theodi."

"Good. We'll remove the catalyst with that and weigh the residue which will be the entire output of our hundred grams of stuff. The percentage will be higher than .004%, I'd say. Come on—"

The communicator barked: "McBride! McBride! This is Peters on Number One, Telfan element."

McBride answered: "What's the matter?"

"Nothing. We're in! We had a bit of trouble getting the warp going at this end. The image-size of Sirius when projected by a lens as close as the fore element is larger in diameter than Sirius is

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according to the distances involved, you know, and getting the warp started across the face of the Telfan Lens was some going. But we're about to thicken the center and shorten the focal length of the aft element right now."

"O.K. No trouble, hey?"

"Excepting it is hot in the hind-end stations. The interstices that give the spill-overs from Lens One do a swell job of heating up the stations when it hits."

"Sirius is hot stuff."

"Look, Mac, how much energy will it take to ruin Soaky?"

"Well," grinned McBride, "Lothar's 'Handbook of Useless Facts' says that a globe of ice the size of Terra, if dropped into Sol, would melt and boil so quick it wouldn't go *'Psssst.'* Is Carlson handy?"

"Here, Mac. On the hind surface in the flitter and it is hotter than the hinges of Hell."

"The one on Pluto?"

"No, the one in the real Nether Regions."

"O.K., Carl. You're the balance wheel in this outfit. If you must aberrate, lean outward a bit, will you? I'd hate to singe the pants off of a couple of billion Telfans whilst trying to save their lives."

"I'll keep an eye on it," promised Carlson.

"Eye?" grunted Peters. He means *ear*. Or has Carlson got his semicircular canals in his eyes?"

Hammond interrupted with a gloating shout. "Mac! We're in! Ninety-one percent. Pure, crystalline Silicon-acetyldiethylsulfanomid. And the charge is almost equal to the galactic mean; meaning that the stuff is stable."

McBride nodded and said into the communicator: "Our half is did, boys. All that stands between we-all and Telfu is a stinking, one-hundred mile satellite. Frankly, I'm agin it!"

Peters did not answer McBride. He shouted, his voice strained with excitement: "Here comes Soaky now, around the edge of Telfu. This is it, gang. Bore him deep and give him Hell!"

Sandra Drake sat down on the edge of a hard bench and took a deep breath. With her free hand, she rubbed her eyes and pushed the stray hair out of them. Her eyes were red-rimmed and puffed with lack of sleep. She stretched and took a longing look at the surface of the hard bench; one of those looks that was calculating not the hardness of the bench but wondering if she could catch forty winks without having trouble call her away again. She decided not. She knew herself, and she knew that as long as she kept going she could stay awake, but if she slowed down for a moment, she'd drop off and nothing would awaken her. And forty winks would actually make her feel worse than no sleep at all.

Outside of the window, dawn was just breaking. It was a strange dawn, an alien sunrise, but one that was nothing new to Sandra Drake. Sirius II was just above the horizon, but almost lost in the mists because of its low radiation. Sirius I was not above the horizon yet, but

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his strong radiation was coloring the sky blue-gray.

Sandra looked out of the window at the graying sky above. Carefully and hopefully she scanned it but she was not surprised that nothing was there for her to see. The idea of doing away with a hundred-mile satellite was too much, even for McBride, Hammond, and the rest of their gang. A hundred miles of celestial body was not large as celestial bodies go, but against man't futile efforts it was simply vast.

In all of the man-made works on Terra, Pluto, Venus, Mars, and Luna, considerably less than the volume of a hundred-mile sphere had been moved. Affected, perhaps, but not man-moved; the pile-up of rivers behind a dam could not be counted.

So man pitting himself against a celestial object seemed almost like sacrilege, though Sandra Drake knew that these men would take a job of analyzing the course-constants of the Star of Bethlehem if they thought they knew where it was now.

And as small as Soaky was against the giants of the galaxy, it was none the less a celestial object.

So she searched the sky hopefully and was not surprised that nothing was there. Her search was more "Will it happen" instead of "When will it happen?"

And then a Telfan stuck his head in the room and called: "Sandrake! Can you come?"

Sandra shook her head, rubbed her eyes again, and went.

"Now what?" she asked wearily. "We don't have to evacuate another district?"

"No," smiled Theodi, "not that bad this time. But we are going out to Loana—a small town not too far from here—and try out some of this latest stuff."

"Have any hope for it?"

"I must have hope," said Theodi.

"That's selling yourself a bill of goods," said Sandra.

"I know. But unless I play self-deception to the limit, I'll quit from sheer futility. No, Sandrake, I must hope with all my soul and I must force myself to believe that this may work."

"I won't even mention my friends," she said.

"You are beginning to give up?"

"I hate to think of it," said Sandra honestly. "It'll be the first time that they failed to do what they said they could do. I know they planned it, perhaps it takes longer than they think. Or perhaps they came unprepared; their equipment not complete. After all," and Sandra managed a reminiscent smile in spite of her feelings, "I've seen them running some of the haywirest equipment in the world and making it perform. Maybe this time the law of averages caught up with them."

"You think perhaps they are finding that our satellite is too much for them?"

"I hate to think of it. I'd hate to admit that they could fail."

"You have changed, Sandrake."

"Have I? I wonder if it is my hope that they will take me home. No, Theodi, in spite of what I may say about them, they know their

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potatoes. They're the typical genius-type. Whether they rate as genius I wouldn't know, but they're that kind of people. Give them a situation, and from somewhere in their memory they can bring forth the darnedest things which fit in like jigsaw pieces to complete the whole picture."

"I hope they continue," said Theodi. "Feel up to coming along?"

"Sure."

"Good. We need you."

"Who, me?" asked Sandra.

"Yes."

"Why?"

"Because you are alien. You are impartially alien. Though you have friends on Telfu, they are few, and in your secret mind you class us all as 'Telfan' and forget about subclassifications. This experimentation is just that, to you, and we are the subjects. Therefore when you select one hundred victims out of a district, we get a perfect, impartial selection; a true cross-section of the district."

"Any of you could do that."

"No. We'd be biased by our knowledge of who is important, who is the sicker, who is young and who is old. And, though it may seem strange to you, you have absolutely no idea of beauty. Therefore you are impartial among the ugly and the beautiful."

"So what?"

"In experimentation on humans, we are inclined to pick those of less value to the community. We pick the lame and the halt and the ugly. We are inclined to pick those who are likely not to live anyway, and this biases our selection. Come, let's get going."

"O.K. Lead on."

Three hours later, and still without sleep, Sandra strode up the line of Telfans and pointed out one after the other. Those selected followed silently to the auditorium in the center of the village and seated themselves. They looked neither happy nor regretful, but rather a resignation was upon them.

Sandra said: "Is this the best place you could pick?"

"Sorry," smiled Theodi. "I didn't know it made any difference."

"I suppose it is good from a functional standpoint," said Sandra. "Being on the stage permits them to pass before us from one side to the other. It is the only clear place in the auditorium in which to work, and as far as I could see, there isn't any other suitable place in town. But being on the stage sort of makes me . . . oh, come on. I'm just tired, I guess. Where's the pills?"

"No pills on this deal," said Theodi, opening a case and removing a set of large hypodermics. "This goes into the vein. Right in the main line. You'll have to help."

"Me? Look, Theodi, I don't feel well enough to go shoving needles into people."

Theodi looked up sharply. Her brash-sounding statement was made in a hard voice in spite of its humanitarian and pleading sound. Sandrake, to Theodi's opinion, was really feeling ill.

"It must be done," he said simply. "You fill and hand them to me."

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Sandra took the first hypo, inserted it into the disinfectant, and then filled it from an ampule. She handed it to Theodi and watched him with fascination as he took the first Telfan in line and thrust the needle into his arm. It went in and in, and Theodi felt around with the needle-point until he found the vein, and then he emptied the cylinder. "Next!" he called, and so on until the hundred had been inoculated.

"Now," said Theodi, "we'll proceed to Dorana and do likewise."

Sandra was silent all the way to the next village, and as she started down the line of people, picking them out one by one, her face began to whiten.

Halfway through, Sanda stopped.

"Go on," urged Theodi.

"*Go on?*" screamed Sandra. "Go on? No!"

"But—"

"Go on and on and on and on and on?" shrieked Sandra in a crescendo that ended in a toneless, inarticulate screech. She stopped the sentence only because her voice had no more range and she had no more breath. "Theodi, I feel like a murderess! I go on selecting people as I would select specimens to be speared with a mounting pin and stuck on a cardboard. I point them out. They follow dumbly with a look of resignation. They come and you try something new on them—every time it is something new, and you don't know whether it'll kill 'em or not! I can't stand it."

"But who can we have to do this?"

"Get one of your own to do your own dirty work! You need me! Bah! Suppose—?"

"Suppose we have the right combination?"

"Suppose you have? You haven't—and you know it."

"I wouldn't say that."

"I would. You're just experimenting." Sandra's lip curled over her perfect teeth in a perfect sneer. "Experimenting on your own kind. And I'm no better. You should hate me—and I'm beginning to hate you and every one of you."

"This must go on—"

"It'll go on without me."

"Come on, Sandrake. Buck up. Here, I'll give you a sedative and you sleep for an hour. You're overtired. Then—"

"Then nothing. I can't go on murdering your people any more."

"It's not murder. It's—"

"It's worse than murder. You go on filling them with colored water and telling them that you think that this is the works—and you know it is just another blind try! Go away!" Sandra whirled and ran blindly. Across the field she ran, out and away from the village. On and on she ran, until she fell breathless beside a small brook.

Thankfully, she dabbled in the brook with her tired feet, and laved the cool water on her wrists and forehead. She drank sparingly, and then stretched on her back to relieve the strained muscles that seemed to make her back arch almost to the breaking point.

Unknowing, Sandra relaxed as the ground supported her back, and

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with the suddenness of falling night, Sandra slept.

Her dreams were less restful than the sleep. They were filled with a whirling panorama of lights, disembodied faces, grinning, leering faces who watched long, brutal needles find the vitals of mute sufferers whose only visible admission of unbearable pain was the tortured look on their mobile faces. And through the dream, McBride and Hammond fought against a huge metal barrier against which their mightiest efforts were futile.

The day wore on as Sandra slept, and night came, and in all that time Sandra had hardly moved. As the darkness fell, she aroused enough to drink from the brook and settle herself in a more comfortable position. Afterward she did not recall awakening at all but she did select a thick thatch of soft moss the second time and she wondered about it later. And it was about midnight when Sandra awoke.

She was slept out, rested. But the self-hatred was still vivid. The dream had kept it there, and though her body was rested, her mind was still tired from the furious mental action that went on even as she slept.

She stretched, rolled over on her back, and considered her actions of before with distaste. That had been a spectacle, and she hated spectacles except when they made her appear in a better light. She searched the sky wearily, picking out Garna, which was Telfu's sister planet, and Ordana, the behemoth of the Sirian

system, both of which were shining close to the bright Geggenschein of Sirius. Above her, she spotted the place where all Telfans watched—the spot where Soaky should be according to their calculations. It was

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not a spot, but an area, and Sandra scanned it in a futile manner.

Nothing yet.

A minute change in the sky along the horizon made her turn quickly, hopefully. She scanned the sky carefully, and yet she knew that looking at the starry curtain was futile unless the scene became so evident that it could not be missed. She could see nothing, and besides, Soaky was supposed to be above, not on the horizon.

She looked above again, but there was nothing to see. Puzzled at that —that *something* that had caught her attention along the horizon. She shrugged, and in trying to rationalize she admitted that it might have been a meteorite; and she knew that she was overanxious.

It was the same, she knew.

But was it? Was it?

Was it?

No, but what in the name of—?

Garna and Ordana and Geggenschein were gone from the Telfan sky. What was this? Why should planets disappear?

Planets were about as permanent as—but they must still remain, it was their light that was gone! Sandra shouted. McBride! The lens. In her mind she saw the scaled layout; Sirius, Telfu, the other planets, and Soaky, the satellite that was oh, so close to Telfu. Place two biconvex lenses, one near Sirius and one near Telfu—and any light from Sirius that could normally reach Telfu—and the planets in line from Sirius —would be cut off by the lens, refracted into the energy beam that would ultimately be focused on Soaky.

They'd started at last! Sandra looked upward into the area containing Soaky.

And as she looked, a mite of colored pinpoint appeared in the sky above. It did not rise into the incandescence, it leaped. It passed upward through the red, the orange, the yellow, and the blue with lightning-flash speed, and then settled down in color to an intolerable white. It seared the eyes, that microscopic speck, and its brightness made it appear huge.

Sandra shok her head and looked down. The darkness was fading, and sharp shadows of the low bushes and herself marked the ground. The stars beside Soaky began to fade to the eye, and as the brightness took on solar brilliance, it was like the sudden return of daylight.

A flicker of the light caused Sandra to look into that intolerable light again. No, Soaky was still going strong. But it was scintillating, now, and there were streamers of incandescent vapor leaving the coruscating nucleus that was Soaky.

Full against Soaky the Sirian beam drove, and the surface vaporized. The streamers were the high-temperature vapors of incandescent metal, being driven away from the tortured satellite by the radiation pressure of that intolerable brilliance. The vapors condensed in finely divided droplets of metal, but still floated away in lines and whorls.

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The landscape around Sandra was in full light, now, and the shadows were no longer sharp. The boiling, blue-white vapors were rushing from the satellite at high velocity, and they spoiled the point-source of light. They danced and flickered in the sky, and as Sandra watched, a slight twinge of terror crossed her, and she caught her breath.

This was not right. This was—was defying God Himself. And Sandra, never awed by the men themselves, fell in fear before the visible evidence of their ability. It was not right, this utter destruction of a celestial body by man. Men were supposed to be motes—bacterium on the skin of an apple—not mighty motes capable of almost literally eating the apple that—not eating but destroying ruthlessly—the apple that was spoiling their barrel.

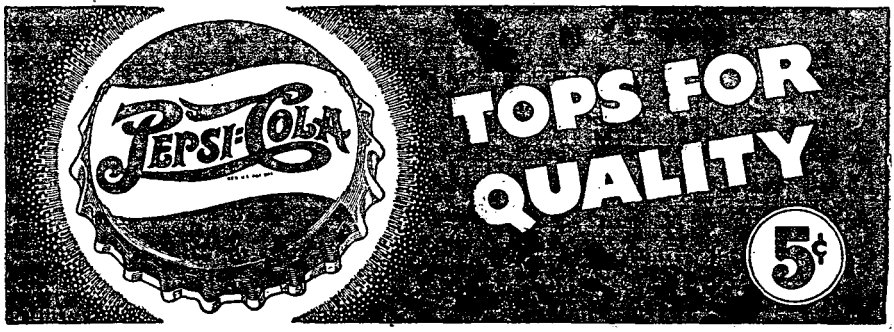
And Sandra, not even awed by the God of her people, prayed to Him in fear. Fear, because people of her race dared to tamper with the universe.

But then the light passed away, and no omnipotent lightning flashed across the universe to destroy it. The night fell again, and darkness, unspoiled, crowded the landscape leaving Sandra light-blind. She fumbled aimlessly in the darkness that was by contrast the utter blackness of no-light.

Sandra Drake was not alone in that. Half of the people on the planet of Telfu were blinking in the darkness; silently groping their way into their houses. Their tongues were stilled by the awesome sight.

Sandra brushed her tattered skirt and smiled. She was a long way from Indilee and she wanted to be there as soon as she could. She was beginning to feel the pinch of the months of loneliness; before, it was futility to lie awake at night and think of the touch of a human hand and the sound of a human voice. Yes, she even admitted to the desire for a bit of admiration, after all, it had been her meat and drink.

But now it was a dream about to come true. There would be people of her own kind. People who could laugh at the hardy jokes of her race, and appreciate the casual acceptance of doing absolutely noth-



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ing for periods of time. The verbal sparring and blocking would be there, too; the nice trick of forcing someone into a trap of his own making and springing it with—not double talk—but triple talk. The sound of people who could discuss both downright earthy things and high theory with the same words but with slightly different inflections in their voices, and be understood by others who knew both lines of talk.

She gave a short laugh. They would never know whether she did it from sheer altruism or because she was scared to death at the idea of being exposed to andryorelitis.

She blinked. The sky flared briefly ahead of her in a brilliant and colorful display of some auroral discharge. It illuminated one full quarter of the celestial hemisphere in flowing color. Sandra thought and remembered a man saying: "The charge on Station One is so great that at twenty thousand feet it would arc a million miles or more." The words and the distances were forgotten, and probably wrong due to her faulty memory for those details, but she did remember something of that nature.

Obviously, one of the Stations had landed with a load of Silicon-acetyldiethylsulfanomid. The not-quite-perfectly neutralized electronic charge must have ionized the upper air in a sprinkling corona.

From another corner of the sky, a similar flare of color flashed, and it was followed by flashes from near and far, each one creating a streaking display of celestial fireworks.

At the sight of that auroral display, Sandra's head went up, her shoulders went back, and there returned to her step a bit of that lilting walk. She smiled crookedly and then broke into that saucy grin. She set her foot on the road to Dorana, from where she could get a ride back to Indiles.

There were Terrans here, all right. Her Terrans that nothing ever stopped. They came—and brought the goods with them.

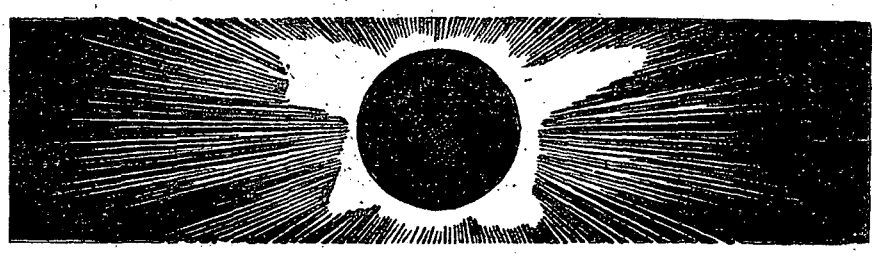
But—who brought them?

Sandra Drake.

Throughout the night, the flashing of the celestial fireworks told the whole planet that Terrans were bringing the needed drug to Telfu. And with each flash, as with each mile, a bit of the old Sandra Drake returned.

There were a lot of miles back to the *Haywire Queen.*

THE END.



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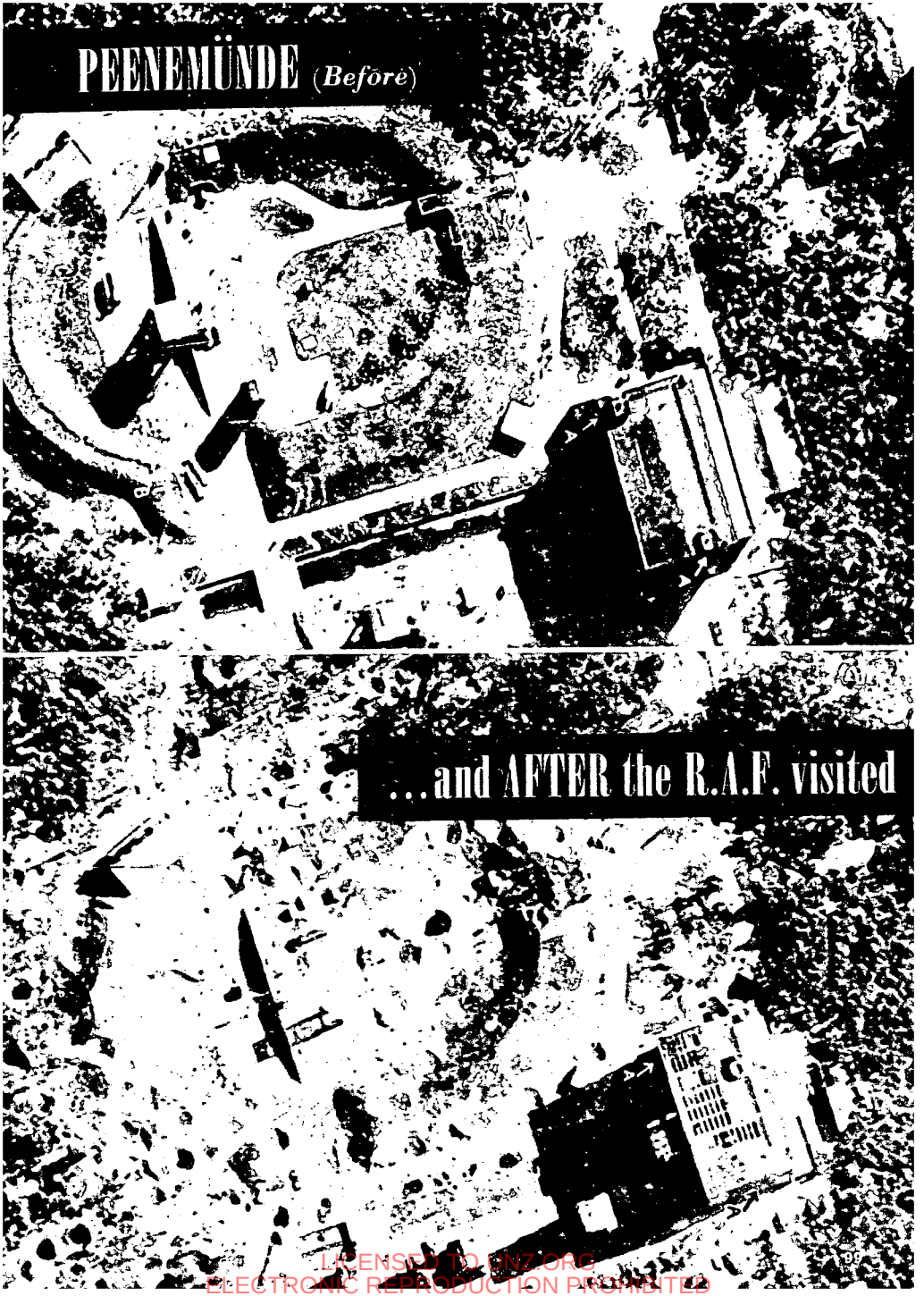

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V-2—Rocket Cargo Ship

by WILLY LEY

Photographs from Press Association.

***This** is the story of Peenemünde, the Nazi rocket experiment station, birthplace of the jet-propelled V-1 and the first rocket cargo ship, V-2. One engineer, well acquainted with his field, can identify the work of another engineer by characteristic touches in the product's design. Willy Ley knows rockets—and German rocket engineers. He can, and does, identify the man who designed V-2.*

The full and complete story of the German rocket research laboratory near Peenemünde on the Baltic coast will never be written. There will be nobody alive who can write it. Most of those who knew the full story are dead already, those that are still alive will die before the war is over.

But the main points, the general outline, of the story of the creation of that laboratory, and more especially the results of its work are known even now, and later efforts will hardly be able to do more than to fill in details.

First: the location. Peenemünde is, or was originally, a small fishing village on the island of Usedom which blocks the entrance to the Bay of Stettin. Its size was such that it cannot even be found on most maps. Its inhabitants, like those of all other fishing villages along that stretch of the Baltic coast, bolstered their standard of living by taking in summer guests, mostly from Berlin, some four hours away by rail.

Even as a seashore resort Peenemünde was not important. Nearby Zinnowitz was more fashionable by far—and Zinnowitz does appear on many maps. The small steamers which, starting out from Swinemünde, provided a coastwise con-

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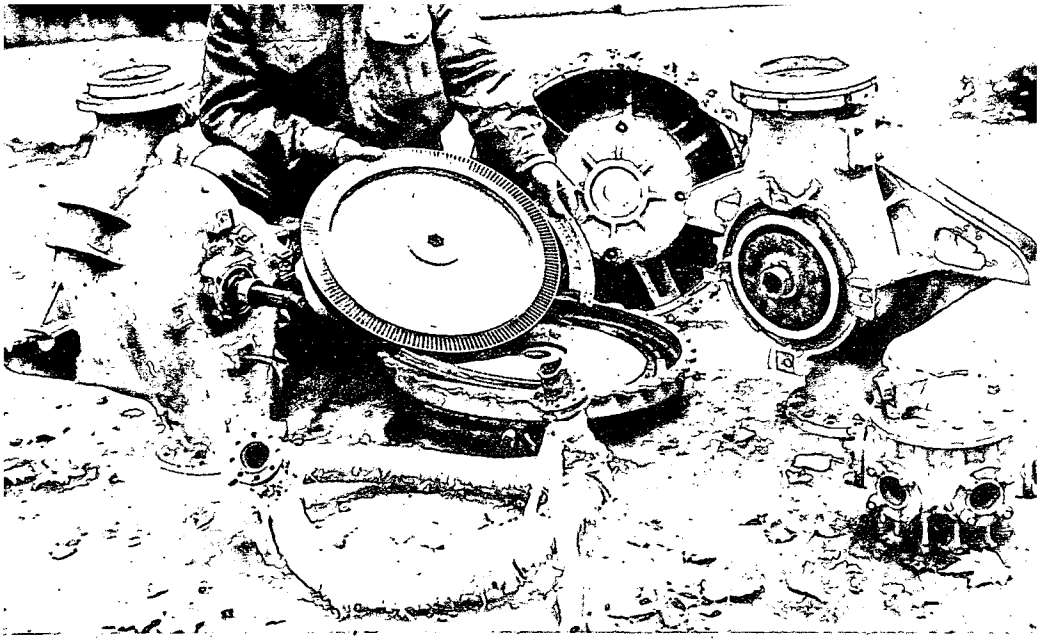

Parts of a V-2 found in Belgium. On the left is the vital fuel pump, at right the oxygen pump with distributor just in front of it. The turbine is in the center, with fuel-mixture line for power to the turbine in front.

nection between the string of seashore resorts on Usedom and then went on to those on the island of Rügen, made Zinnowitz their last stop before shuttling across to Rügen, Peenemünde was neglected and could only be seen in the distance from deck.

But it is possible to locate Peenemünde with fair accuracy even on a map where it does not appear. If you draw a straight line from the city of Stettin to the northernmost point of the island of Rügen that line will cut the coastline very close to Peenemünde, about two thirds of the whole distance from Stettin.

The Nazis selected this site for two reasons: it was at the seashore and out of the way of the main coastwise traffic. Being located at the tip of a long island all land approaches could be easily sealed off, while the sea approaches could be patrolled without difficulty. It is possible that Hermann Oberth, who by some sources is credited with originating the idea for that laboratory, had something to do

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This whole section had some fame in the history of German rocket research. Between the island of Usedom—and Peenemünde—and the large island of Rügen there is the tiny little islet which is known locally as the Greifswalder Oie. When Oberth was working feverishly to complete his first rocket which was to be sent into the air on October 15, 1929, the day of the first showing of the Fritz Lang film which had provided Oberth with the necessary cash, he had the Oie in mind as a place from which to launch the rocket.

The fact that there was a lighthouse on the Oie prevented him from obtaining permission to use the island for this purpose. He then selected the coast of the mainland near the seashore resort of Horst, some forty miles East of the Oie. Two years later Johannes Winkler brought his second liquid fuel rocket to the Oie, hoping to persuade the authorities in charge to grant him the permission Oberth had failed to obtain. Winkler, incidentally, failed too. And then, finally, nearby Rügen was the "site" of the famous Fischer Hoax of 1933 which told about the "secret demonstration" of the fabulous man-carrying rocket of the Fischer Brothers who never even existed.

If Oberth had anything to say about the matter, it would be like him to select the site for a rocket research laboratory. Of course, we don't know yet just how much his words and wishes counted with the Nazis.

rocket research laboratory, which was later found and mapped and bombed by the R.A.F. with great thoroughness.

Now the probable date of its founding.

When the Nazis came to power in Germany in February 1933 they discouraged all rocket research. The German Rocket Society was torn apart, the men who had worked under its auspices were distributed in commercial jobs which had nothing at all to do with rockets. The testing ground became an S.A. drill ground, the records disappeared in the files of the Gestapo.

Three groups had been interested in rocket research in Germany during the months before that happened. One was, of course, the German Rocket Society itself which had progressed to rocket motors delivering a thrust of four hundred forty pounds. The second group consisted of one man and his boss. The man was Pietsch, who was chief engineer of the Industrial Gas Company, Inc. and the owner, Dr. Heyland.

Dr. Heyland had been Max Valier's last sponsor and after Valier's death Pietsch had overhauled the liquid fuel propelled rocket automobile on which Valier had been working and had demonstrated it on two public test runs in April and May 1931. His rocket motor was very inefficient from the point of view of fuel consumption, but it did produce a thrust of about three hundred fifty pounds, weigh-

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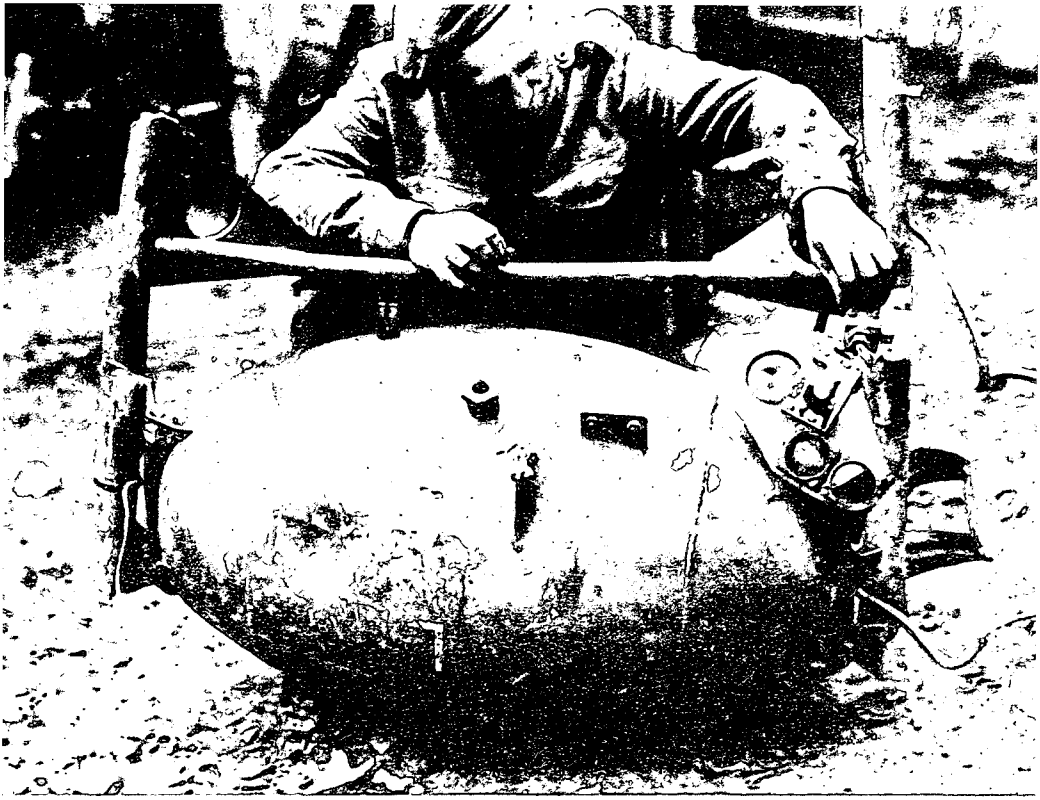

The oxygen tank of a V-2 bomb.

ing some forty pounds itself.

The third group consisted of one man and his assistants, Friedrich Wilhelm Sander of Wesermünde who had manufactured the powder rockets for Valier's and Opel's rocket cars and rocket gliders. Sander was interested mostly in powder rockets, but had an interesting idea which, I think, bore fruit later on. He wanted to eliminate the danger of explosion and reasoned that this danger was due to the fact that in a powder rocket "combustion chamber" and "fuel tank" are one and the same thing.

The liquid-fuel enthusiasts had pointed to that until even Sander who, after all, had a commercial interest in powder rockets, had to admit it. Sander then thought of building rockets of metal, with separate tank and combustion chamber, but still with powder for a fuel: *liquid powder*. He succeeded. In summer 1931 he staged a demonstration of products of his factory, signal rockets, line-throwing rockets,

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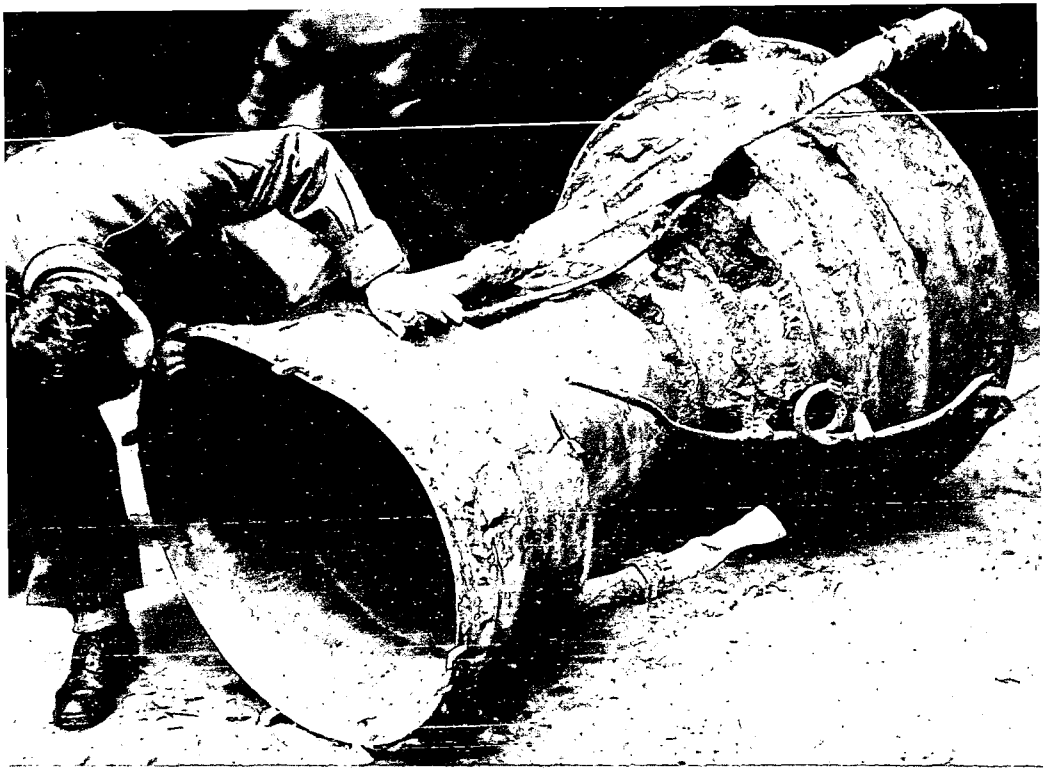

Bombardier Snell takes a look at the jets inside the rocket throat of a V-2.

rockets throwing self-inflating life-savers et cetera. Among the novelties shown there was the liquid-powder rocket. Witnesses stated that it looked "like heavy black machine oil," but the composition was, of course, Sander's trade secret.

Add to this some experiments made by the *Reichswehr* before Hitler. The *Reichswehr* did not consider liquid fuels of any kind, they wanted storable powder projectiles. Rumor has it that they attained a range of thirty thousand yards after some time—it was not specified whether vertically or horizontally—and that the project was then shelved for future reference.

At the time Hitler was actually coming to power no rocket research went on anywhere in Germany and this state of affairs was to prevail for another three years.

All the while Hermann Oberth was sitting in Mediash in Rumania, being simultaneously "at home" and "in exile," smoldering over his own misfortune and hating everybody, most especially Rumanians, Rus-

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sians, Prussians, Jews and other rocket experimenters. He did some work of his own during that time, as evidenced by an interview which appeared in the Swiss newspaper *Neue Zürcher Zeitung* in 1935, but that work was in the nature of tinkering in the basement and in the school laboratory. Also he was, according to his own statement, an active member of the German Nazi organization in Rumania.

In 1937 he established, presumably through that organization, contact with the German Army and most especially with Colonel Albert Kesselring—now Field Marshal Kesselring in command of the German forces in Northern Italy.

Naturally there is no record of that conversation or conversations. But it is not difficult for someone acquainted with Oberth's conceptions of rocket theory to reconstruct the main points of those talks, especially in view of the results that became apparent later on.

Some time ago I wrote an article for Astounding about the use of rockets in place of artillery. The conclusions I arrived at were simple, but subsequent correspondence has taught me that some readers missed the points I tried to make. The most important point was that there is an upper size limit for powder rockets and that within the possible size limits rockets are inferior to artillery in two respects.

One is accuracy. Modern guns place their shells with extreme neatness, almost as neatly as if they were carried over to the target and dropped by hand. Rockets are not that accurate, rockets are what the military calls "area weapons," capable of beating a given area but hitting the target or targets within that area only by chance. The second drawback which I pointed out was the higher powder consumption. For a given range which can be attained by rockets as well as by artillery the rocket always needs at least three times as much powder to get there than does the artillery shell.

These two drawbacks are confronted by two advantages. One is the fact that rockets do not need guns. Guns are expensive pieces of precision workmanship. Rockets need only launching tubes which are neither expensive nor works of precision. The second advantage is that one can bank almost as many launching racks together as one feels like. The result is a very heavy volume of fire. It takes longer to load a launching rack than it does to load a gun, especially modern guns with automatic or semiautomatic loading mechanism. But for each salvo the volume can be much heavier.

My final conclusion was, when I wrote that article, that long-range powder rockets could not be built, that it would need a liquid-fuel rocket motor to make long-range rockets possible. Anything that needs a mass-ratio higher than 1:1 must have liquid fuels—and there is a disadvantage connected with that. One of the liquids is liquefied oxygen, and liquid oxygen cannot be regarded as a storable fuel, at

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least not in the sense in which powder is storable. You can, of course, store liquid oxygen for a few days, even weeks, if the quantity is large enough, but military projectiles are often stored for a year or more.

Liquid-fuel rockets, therefore, could be used only from a base where liquid oxygen is available, they could not be carted around in the field in the same manner as, say, a heavy howitzer and ammunition. But liquid-fuel rockets, if you make them only large enough, have a long range which makes up to a large extent for their lack of mobility. Very heavy guns are not very mobile either, except those mounted on a floating base called battleship.

What Professor Oberth told Colonel Kesselring must have been about the same I wrote in that article. Then Oberth would draw the following conclusions:

A. Liquid-fuel rockets can have a long range only if they have a high mass-ratio. They can have a high mass-ratio only if it is possible to evolve a light-weight high-capacity pump so that the fuel can be pumped from the tanks into the combustion chamber. That way the tanks can be thin-walled since they do not have to stand a higher internal pressure than the weight of the fuel multiplied by the acceleration of the rocket plus an added safety factor. The first job to be done, therefore, is the development of such a pump. Oberth probably pointed out that he had a design for such a pump which would work, or, if not, could at least be used as a starting point.

B. Once such a pump has been developed it is possible to build a high mass-ratio rocket for very long range, up to about six hundred miles. (Beyond that the mass-ratio would grow so, big that a step-rocket would be required.) Six hundred miles, considering European conditions, is very long. Such rocket batteries when stationed in Berlin, could sweep a circle outside the pre-war German border in any direction.

C. Being able to build a certain mass-ratio at all is almost equivalent to being able to build rockets of that mass-ratio in any order of magnitude, within reasonable limits. (One probably could not build such a rocket with a total weight of only twenty or thirty pounds). Thus, if one can produce a rocket having a mass-ratio of 6.5:1—which, for fuels like alcohol or gasoline, amounts to saying "a rocket with a range of two hundred fifty to three hundred miles"—it is mostly a matter of choice, or of military considerations, how big the final weight is going to be.

D. Considering the range over which they could be fired the

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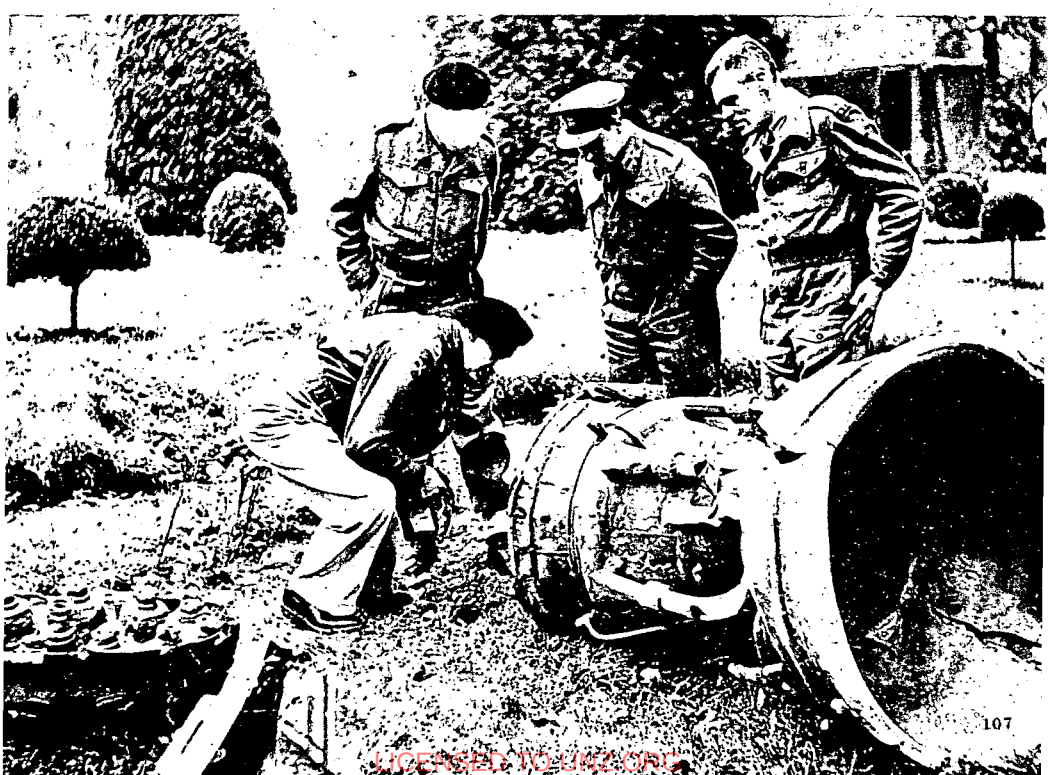
accuracy of these rockets is going to be high and the remaining lack of accuracy could be made up by using poison gas which will spread over a certain area.

E. While there are many theoretical reasons why rockets should not have wings it is possible to build a rocket-propelled airplane. It should be short and squat and generally bat-shaped rather than bird-shaped and should leave the ground vertically as long as the fuel tanks are full. I have a drawing of the general appearance here on page 280 of my book, if the Herr Oberst will be good enough to glance at it —

I did not invent this conversation, not even the wording. It can be found almost in its entirety and with almost the same words, in Oberth's *"Wage zur Raumschiffahrt."* I merely got the rather scattered

This British official photograph shows the rocket throat from another angle —and Field Marshal Sir Bernard L. Montgomery looking it over. In the left foreground is the jet-bearing head of the rocket combustion chamber.



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Due to the enormous speed with which the V-2 arrives, it has less blast effect, we are told, than does V-1. But this scene in southern England shows what the twenty-two hundred pounds of HE can do, despite that.

references together and condensed them considerably. But this is how Oberth saw the problem of the long-distance war rocket as far back as 1929 and I still remember a conversation we had at that time.

Oberth and I spoke a good deal about long-distance mail rockets then and I wondered about a certain difficulty. The problem was this: if the mail rocket was to travel over a distance where the use of rockets would really involve a saving of time, it would have to be a high mass-ratio rocket, from about 5 : 1 up. Now such a mass-ratio was impossible without a pump—still to be invented—and that pump, no matter what shape it took, would have a certain minimum size. This automatically decreed a minimum size for the whole rocket and probably a large size, the payload available might come out as high as a thousand pounds.

"And do you think, herr professor, that there will be a need for rockets carrying a thousand pounds of mail over five hundred kilometers?" (About three hundred miles.) Oberth looked at me with the smile which old-fashioned pedagogues reserve for people whom they call "my dear young friend" and said after a while: "There will be need for rockets which carry a thousand pounds of dynamite over five hundred kilometers."

Oberth convinced Kesselring about such a need.

First, Swedish observers say, Oberth was provided with a camouflaging job in Germany. In ordinary German academic life it would have been impossible to give Oberth a professorship at a German university. The major obstacle was that he lacked a doctor's degree, the secondary obstacle was that he had been neither assistant professor nor *privatdozent* — "private lecturer," meaning one who receives no salary from the university—anywhere. The term "professor" as applied to him, meant that he was teacher at an ordinary high school in, of all countries, Rumania. Normally he would have to fulfill both the requirements mentioned to be even eligible for a full professorship.

The Nazis made him "Professor of Physical Astronomy" at the University of Berlin, which, under the circumstances, conformed to academic tradition about as much as a foreign-born president would conform with the Constitution of the United States.

He may have taught astronomy for a while, provided that the Hitler youth was interested in astronomy, unless ordered to be. But from all we know and can know at this moment the founding of the laboratory near Peenemünde fell into the time of Oberth's professorship in Berlin.

No doubt that this laboratory was not only built in extreme secrecy, but that it was also endowed with all the safety measures and precautions which could be thought up by the Gestapo on the one hand and Military Security on the other. It is certain that none of the technicians and scientists working there knew the full program, each one learned only as much as he needed for doing

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his own job right.

Naturally nobody employed there could be permitted to go home. The actual construction work began most likely with the construction of homes for the people to be employed there. The fact that Peenemünde could pass as an inexpensive seashore resort helped: *Kraft durch Freude* built one of its innumerable *Ferienheime* — "vacation resorts" —at Peenemünde. If any member of the Labor Front of which *Kraft durch Freude*—"Strength through Joy"—was only a part, had any special reason for wishing to spend his vacation in Peenemünde and applied for that particular resort he was assured that there was no room. If he insisted he was probably investigated as a spy, not dreaming about the real reason for the investigation.

Of course the answer was not even a lie, this particular resort was filled up, with engineers and physicists, presumably with everybody who had, in the past, shown interest in rockets and who had been passed by the Gestapo.

There was more than one laboratory, not only in the sense that the laboratories occupied a considerable number of buildings. The whole *Institut,* as it was probably referred to, was subdivided into several branches, certainly more than two, probably four. Of the two we know definitely, they might now be conveniently labeled V-1 and V-2. If the rocket weapons used by the German soldiers in the field were also developed at Peenemünde, as seems likely, the powder laboratory or laboratories formed the third branch. And if the propulsion unit for the rocket-propelled Messerschmitt 163 was developed there we get a fourth branch or department.

Oberth was not the head of the whole, but he probably was the department head of the V-2 branch. That he developed the V-1, the well-known jet-propelled robot bomb, was claimed when this weapon was new, but it is highly unlikely. While the V-2 bears many of the earmarks of Oberth's thinking and reasoning, V-1 not only lacks all of them but embodies some features which Oberth would never have used, if his word had counted.

The French physicist and collaborationist Georges Claude, otherwise a justly famous man, has recently been arrested because he is said to have invented V-1. It is quite likely that Claude contributed to the design, but the nature of V-1 is such that no one man can be called its inventor." The idea of an aerial counterpart to the naval torpedo, a self-propelled, unmanned and explosive-laden airplane—just as the naval torpedo is a self-propelled, unmanned and explosive-laden, small submarine—is by no means new, in fact the United States developed such a weapon in 1918, too late for actual use. It did not only carry a "bomb" of the same weight as V-1, it had four hundred miles range as compared to the V-1's one hundred and fifty miles.

Nazi-controlled newspapers have named one Heinz Bunse as "inventor" of the V-1 after the initial assault on London was made. This

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mention caused a great search through biographical reference works, but the search was fruitless. Heinz Bunse could not be found, he probably was—or still is—a Nazi protégé, presumably placed in command of the V-1 development section for purely political reasons.

Some other candidates for the somewhat doubtful honor of having invented V-1 have also been named—I myself among them—usually on the strength of certain features of the robot bomb, covered by patents owned by the men in question. While it is quite possible that these patents were utilized, there is no guarantee of any kind that the men in question were even informed about it.

The results of the research work done at Peenemünde, as they emerged on the battlefields, are the following:

Powder Rocket Branch:

Nebelwerfer 41 (Smoke Thrower, Model 1941), the well-known six-barreled rocket mortar. In two sizes: 150 mm and 210 mm. The projectiles are between four and five feet long and come in many shapes and manners of manufacture. The range is around six thousand yards, the tubes are fired electrically around the circle, with one-second intervals between rockets. The range of the large type seems to be up to nine thousand yards. When fired an enormous flash and back-flash is produced. Tactical employment is the same as that of field howitzers, but the *Nebelwerfer* is far inferior in accuracy. The name implies that it was originally developed as a chemical mortar.

Schweres Wurfgerät ("Heavy Throwing Engine"). This also comes in two sizes, the 320 mm incendiary rocket and the 280 mm high-explosive. Each type was used at first singly, with the shipping crate doubling as a launching rack when propped up and then in units of six, two rows of threes banked together on an artillery carriage. The projectiles for the smaller size weigh about one hundred eighty pounds, the larger size over two hundred thirty pounds. The large type always holds about eleven gallons of incendiary fluid—oil and gasoline—the smaller one always high-explosive, even though some were found marked with a yellow cross, the German marking for mustard gas. Employment is similar to that of the *Nebelwerfer*, but the range is not over two thousand yards. The rocket proper of the *Schweres Wurfgerät* seems to be the same as that of the larger variety of the *Nebelwerfer*, being also 210 mm in diameter.

Airplane rockets. First encountered in quantities over Schweinfurt by Flying Fortresses. The range which can be utilized seems to be well over one thousand yards, the caliber of the rockets around 80 mm.

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The Focke-Wulfs carry only two, one under each wing, while Allied rocket-equipped fighters carry up to eight.

A.A. rockets. Antiaircraft rockets, similar to the Z-guns of the British, were first used in quantities in the defense of Berlin. They seem to be able to attain a maximum altitude of around twenty thousand feet. Not much is known about their size and construction. But calculations of probable size and resulting performance, published by Ley and Schaefer in the July, 1944, issue of *The Military Engineer* led to the following results, with assumptions based on the known data of high-compression powder rockets built by F. W. Sander:

	Take-off weight (lbs.)	Weight empty (lbs.)	Mass-ratio	Peak velocity (ft./sec.)	Total altitude (ft.)	Time required (sec.)
Type	I. 176	66	1:1.6	1270	29,000	48.4
"	II. 207	97	1:2.14	1170	27,000	49.1

The column "weight empty" is understood to include a projectile of about twenty-six pounds. The figures of twenty-nine thousand and twenty-seven thousand feet, respectively refer to the altitude where a rocket the projectile of which did not explode, would begin to fall back. Naturally this peak altitude cannot be utilized for A.A. fire. The peak velocity occurs in both cases twenty seconds after leaving the launching rack, and in both cases around thirteen thousand feet.

This, then, are the known results of the work of the Powder Rocket Section of the German research laboratory. That section also produced a German *bazooka*, patterned after the American rocket launcher but much heavier and more cumbersome, and a rocket-accelerated bomb, patterned after those used by the Russian *Shturmovik* planes.

Going over to the work of the Flying Bomb Section it may be useful to switch viewpoint, and tell the story as it unfolded to the Allies.

As early as 1942 the Allies, and more particularly the British, knew that the Germans were concentrating on a new weapon. Suspicion quickly centered on Peenemünde which was already marked in the files of the Allies as the development center of German rocket weapons. R.A.F. reconnaissance planes, ranging all along the Baltic seashore, took photographs of many places, among them Peenemünde. Much of the photographing was done rather openly, so that the Germans would get used to photographic reconnaissance over the Baltic. Sometimes the R.A.F. came mine-laying, which furnished a reason for all the photographing.

As a matter of fact it is said that the Germans in Peenemünde, standing behind the lines of electrically charged barbed wire which kept visitors away, became careless and just glanced at the British planes. The British planes took pictures of them, mapping the whole layout in the process so that there was little doubt what each building represented. Some were dwelling places,

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some were administration buildings where plans and blueprints were kept. Still others were storage buildings and workshops.

One day one of the pictures showed a very small airplane on a launching ramp. A little later some stories began to leak out from the Danish islands, even though these islands were occupied by the Germans. The stories told of the crashing of small unmanned airplanes of German manufacture, obviously crewless to begin with, doing no particular damage.

The world as a whole was still unaware of Peenemünde and kept watching the Russian front and the North African campaign. But by the end of August, 1943, everybody knew that Peenemünde must be important—*very* important.

During the night of August 17-18, 1943, the R.A.F. sent what was then an exceptionally large force of heavy bombers to the unobtrusive northwestern tip of the island of Usedom. Two thousand tons of bombs were concentrated on that small spot. Such an expenditure of bombs was in itself a strong hint that the target must have been important before the bombs rained down upon it. What was an even stronger hint was the admitted loss of forty-one aircraft. This meant that the out-of-the-way spot was heavily defended.

The result of that heavy and costly raid was in keeping with the

Arriving before the sound of its own coming, the V-2 doesn't produce the dire foreboding effect V-1's sputtering, coughing motor does. If you hear V-2—you're safe. Three Britons who died in these homes didn't hear it.

effort and the losses. As Prime Minister Churchill described it later —speech of July 6, 1944: ". . . very great damage was done to the enemy and his affairs and a number of key German scientists, including the head scientist, who were all dwelling together in a so-called Strength-through-Joy establishment, were killed."

Churchill did not name the "head scientist" in that speech and it was generally believed that he referred to *Oberth*. Months later Allan A. Michie of the *Reader's Digest* was permitted to reveal the name of the *kommandant*; he was forty-nine-year old *Luftwaffe* expert Major General Wolfgang von Chamier-Gliesezenski. It was then also revealed that, for reasons of secrecy, the bomber crews of the R.A.F. had no idea what they were ordered to bomb. Only a few group leaders and Intelligence knew. Intelligence had also chosen the date, not only because of moonlight, but because it knew that at that time some seven thousand scientists, technicians and precision workers were assembled in Peenemünde.

It transpired later that five thousand of them died during that night, a good number of them from the explosion of their own stores, set off by blockbusters. The Luftwaffe's chief of staff, General Jeschonnek, was among them, he had been visiting Peenemünde. It is likely that Ernst Udet, whose death was announced a short time afterwards, was there too at that time. Half of all the buildings—there had been forty-five dwelling places before the attack and about one hundred workshops, storage buildings et cetera—were completely destroyed, the other half badly damaged.

There is no way of telling whether the long delay in the use of V-1 and V-2 was actually due to that raid or whether the Germans planned to hold these weapons back until the Allied Invasion came. The latter is more probable, because Peenemünde, while the heart of the research work, was not the only production center. One was found near Vienna and the 15th U.S. Air Force, operating from Italy, paid several visits to it. There must have been others too.

Even Peenemünde itself had to be subjected to "touching up," the R.A.F. went back in strength about one year after the first raid and in between the 8th U.S. Air Force, operating from England, went over more than once.

The big August raid seems to have broken the back of the research staff, but a great deal of the research had been done before the raid was made, as subsequent events showed.

The first aftermath of the August raid was—strange workings of the Nazi mind—a wave of propaganda We have terrible secret weapons, Dr. Goebbels screeched, enormous rockets of fearful power, but so far the Führer has not given the word to use them. The implication, stated later on in so many words, was that the Führer was too humane to use the weapons at his disposal —even though he, one may add, was

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losing the whole Mediterranean at the time and "disengaging" himself in Russia at a rate without parallel in military history.

In September the Goebbels Ministry "revealed" that the new weapon would be used against England, America being unfortunately out of reach. The spokesman added "for the present," after a short pause.

On September 26th "specific" information began to come over the wires of the various press services. A Swedish journalist whose name was given as Gunnert Pihl in the dispatches from Stockholm stated that the weapon was a long-range rocket, fired from monster barrels a hundred feet long. The barrels, he stated, were installed within a fifteen-mile radius of Calais and Boulogne. The range of the rockets was given as one hundred twenty-five miles, and it was stated that the pressure in the barrel was so excessive that it would stand only twenty rounds.

To any expert it was clear that the report was either straight German propaganda or a badly garbled version of the real thing. While it did seem likely that a rocket large enough to travel one hundred twenty-five miles would require a hundred-foot launching tube, the statement about the short life of these tubes was obviously wrong. Either the projectiles were rocket propelled, in which case the strain on the launching tubes could not be too excessive, or else the launching tubes were actually long-range guns and in that case there was no need to call them rocket guns.

Whether Pihl's tale was Nazi-inspired or not, the German Propaganda Ministry observed the large amount of publicity it received everywhere and on December 13, 1943, some more material flashed over the press wires, originating this time from "diplomatic sources" in Zürich. The report, as received in this country, read as follows:

Zürich, December 13 [1943]—UP—Germany has been conducting tests with a rocket shell forty-five feet long, weighing twelve tons. Thirty feet of the shell's capacity, it was said, is needed for the driving apparatus and fuel. The rocket allegedly is effective over an area of twenty square miles because of the explosive force generated by its charge of compressed nitric acid. It was said that the shell has a theoretical range of one hundred sixty miles although in tests thus far it has been confined to thirty-five- and forty-mile distances.

These sources said the Nazis have begun the assembly of rocket catapults on the French Channel Coast despite the fact that tests of the projectile are not yet complete.

It was claimed that the Germans have been experimenting with steam-driven catapults. These reportedly would enable the rockets to be launched with an extremely low initial velocity. The projectile is driven by compressed Diesel oil which lends its propulsive force immediately after the rocket leaves the catapult. . .

All this sounded like so much hogwash. Just what was meant by an "effectiveness over twenty square miles" remained a mystery which nobody could clear up. It was obviously meant to imply that the area of destruction would be twenty square miles large, but it could also

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be construed as dispersion or, if you stretched things, even range. It remained mysterious why nitric acid was used as an explosive, not to mention the minor fact that nitric acid as well as Diesel oil, both being liquids, are incompressible to all intents and purposes.

It is now clear that the dimensions given were correct for V-2, while the range is that of V-1, but there was no way of telling then.

At the same time, however, reports came more and more often that heavy Allied bombing formations had dropped the biggest possible tonnage of bombs on mysterious targets in the Pas-de-Calais area which was quickly christened Rocket Gun Coast. I figured out at that time that a rocket, fired from the so-called Rocket Gun Coast, and supposed to hit London, would have to have a mass-ratio of 7:1. Since I was assuming powder as a fuel I doubted the tales of long-range rockets, writing: " . . . it boils down to the question whether we want to believe that the Germans can build such rockets. If we do believe it we still have to ask ourselves what good such rockets, being inaccurate, could do." I suggested then, in December 1943, that the weapon might be a crewless plane, stuffed with TNT and guided by a radio beam.

That article had just been published—in *PM*—when other papers published a report that the Germans had used their giant rocket guns for the first time. The story was retracted the following day, it had been an almost ridiculous error. The Germans had stated that they had used *Leuchtgranaten*—flare shells—during a minor naval action in the British Channel, an attack on a British coastwide convoy. The translator had confused *Leuchtgranaten* and *Leuchtraketen* which latter word means "distress rockets." Apparently that did not make enough sense to him, so he dropped the inconvenient "distress," thus making big headlines.

The latter part of December was filled up with reports on an actual weapon: the German glider bomb, launched against Allied shipping from various types of German bombers, Dornier 217, Heinkel 177, Junkers 290 and Focke-Wulf 200. These glider bombs, weighing about seventeen hundred pounds, were some ten feet long and had ten-foot wings. They had a rocket propulsion unit—it is not known whether powder or liquid fuel—and could be directed by radio-control from the plane which had launched it. The glider bombs were as a rule not too accurate, but did sink a few vessels. It is said that the sinking of the Italian battleship *Roma*, during its last voyage to surrender at Malta, was accomplished by such a bomb, but other sources state that this was done by a torpedo plane.

The confusion was miraculous to behold: Churchill's disclosures about the rocket glider bomb—a Peenemünde product, no doubt—German-inspired stories about super rockets, daily bombings of the "mystery targets" of the Rocket Gun Coast all arrived together, were garbled with each other and

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discussed with the most appalling lack of technical knowledge by newspaper commentators, especially the air-power branch.

On January 16, 1944 a rocket story to end all rocket stories came from Stockholm. The super rocket was, according to that story, carried aloft by a bomber and then ignited. After ignition it would rise to a thirty-mile altitude and hit targets sixty miles away. It consisted of three compartments inside:

> "One compartment contains a charge of eight hundred eighty pounds of liquid air and Uranium salt solution, the second holds the four hundred fifty to six hundred fifty pound propulsion charge consisting of coal oxide and picric acid, and the third contains the ignition mechanism believed to comprise radio-active salt solution and quicksilver."

Goebbels' Ministry, shouting nonsense at the top of its lungs, added a few days later: "Such rockets will cause artificial icebergs in the Channel in case the Allies try a suicidal invasion of the mainland of Europe where they will smash their heads against the Atlantic Wall."

By the end of January a correct-sounding report came, sent by wireless to the New York *Times* by C. L. Sulzberger, then with the Fifth Army in Italy. The Nazi secret, he wrote, is a crewless plane. "Flying at high speed it would be extraordinarily difficult to stop with either fighter aircraft, air mines or balloon barrages. . . ." And, Mr. Sulzberger added: "It was only after Allied bombing began wrecking the take-off points that the Germans, realizing the Allies were in on their secret, began to brag about its terrific potentialities."

Goebbels then spoke of the *Wunderwaffe,* the "miracle weapon," which would win the war for Germany quickly, once the Führer makes the decision to use it. Berliners, of course, abbreviated *Wunderwaffe* to Wuwa—which sounds as funny to a German as it does to an American—and every once in a while would ask *"Wo bleibt die Wuwa?"* ("What happened to the Wuwa?") But the Wuwa did not appear. Eisenhower and Montgomery invaded France. For a few days things hung in a balance. But no Wuwa.

One week after D-Day the first robot bomb appeared over England's southern shore. The Wuwa —meanwhile re-christened *Vergeltungswaffe* or weapon of retaliation and specifically designated as V-1—had made its appearance. It was a pilotless plane, 25.4 feet long, with a wingspread of 17.67 feet, carrying a warhead with one thousand kilograms—twenty-two hundred pounds —of high explosive, propelled by an intermittent jet engine, flying at a top sped of about 360 m.p.h. and using one of its one hundred fifty gallons of low-grade aviation gasoline for every mile of flight.

A few weeks later the Berlin radio told that during the early experiments in 1942 the flying bombs had had a tendency to shed their wings and that the trouble could not be found until Anna Reisch, a German

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woman pilot, had made several flights in one, observing her own vehicle through a periscope. She got the Iron Cross, First Class, for her feat, having been "not dangerously injured" in the experiment.

And British Intelligence had a report on hand stating that Hitler himself had watched a demonstration, seeing a robot bomb chased by a captured *Spitfire* and smiling with satisfaction when the *Spitfire* was slowly left behind. The real *Spitfire* pilots quickly learned that they could make up for the difference by diving on the flying bomb.

"After the bomb had been in the air for a certain number of minutes," to quote from the official history of the "robot blitz," written by the British war historian Hilary St. George Saunders, "a clockwork mechanism locked the elevators so that it dived into the ground. When the bomb tilted, any gasoline remaining in the tank flowed away from the propulsion unit, cutting off the engine. In several cases the engine stopped before the dive, which gave rise to the belief that there were two kinds of bombs, one which stopped and fell steeply and another which stopped and glided. Actually it was the same bomb—"

The remainder of that story is statistics.

During the interval from June 12, 1944 and August 30, 1944 the Germans launched eight thousand seventy flying bombs, all aimed at London. (There was a second battery of launching racks, aimed at Bristol, but it was still incomplete when it fell into Allied hands.) Over two thousand of them, one out of every four, fell into the Channel, strayed from their course, or crashed near the take-off ramps —the Germans offered French civilians as much as one thousand francs a day if they would help them launch flying bombs. Fighter interception destroyed twenty-four percent of the bombs in flight, A.A. guns and rockets accounted for seventeen percent, balloon barrages for five percent so that only two thousand bombs, or about twenty-nine percent actually fell on London.

They killed 5,864 persons, injured 17,197 badly and 23,174 slightly, destroyed 24,491 houses, rendered another 52,293 uninhabitable and damaged over 950,000. The results were impressive as far as figures go, their influence on the course of the war was nil.

V-1 had two main weaknesses. One was inherent in the design, the other is inherent in the type of weapon. The weakness in design was the jet motor. It was of a type which could not work at rest but needed a speed of at least 150 m.p.h. which necessitated the launching ramp and take-off help. Most of the twenty-five percent which did not cross the Channel did not do so for reasons of faulty take-off. Also, the take-off ramps were fine bombing targets if they could be found.

A different type of engine, whether jet or conventional, would cure most of these troubles. If an engine which can work when at rest

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were used, there would be hardly any crashes near the take-off point, there might be no need for take-off ramps but just for runways.

The weakness inherent in the type, which would remain, is interceptibility. It is a good guess that interceptor planes which are expected to come back and which carry a valuable pilot, will always be faster than the flying bombs of the same period. And as the performance of the flying bomb improves, the performance of A.A. gunnery will improve too.

The Flying Bomb Section of Peenemünde did not create an irresistible weapon. But it did create a novel weapon which is destined to remain standard equipment of all armies and probably of all navies too. It will always be more or less an area weapon, but there is need for area weapons too in warfare.

Leaving the work of the V-2 section of Peenemünde to the last, the result of still another probable section of those laboratories has to be mentioned.

When the robots streaked across the Channel there were occasional reports of a larger type, almost twice as fast as the flying bomb. But while there is no reason to doubt the words of the pilots who reported what they saw, there is reason to doubt their interpretation. Examination of wreckage failed to disclose the existence of a larger type of flying bomb, although such a larger type would have been possible, of course.

What the pilots probably saw were samples of still another German invention, presumably also from Peenemünde, the rocket-propelled fighter plane Messerschmitt 163. The Me 163 is not a jet plane, as is often stated, it is a rocket plane.

It was encountered later—on August 16, 1944—over Leipzig. Suddenly things swished past the Flying Fortresses, so fast that the crews failed to see them clearly. The fighter pilots, flying fast Mustangs, had a better chance. The strange planes still left the Mustangs behind at a rate of 250 m.p.h. or more, but the Mustangs succeeded in intercepting them on occasion. The Germans were faster, but by the same token less maneuverable.

The pilots said later that these

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Germans "were ugly things, looking like bats flying around." Their fuselage was very short and stubby, the wings were so strongly tapered as to be almost triangular. The fuselage did not project at all beyond the leading edge of the wing in front, and projected for only a few feet beyond the trailing edge in the back, leaving no room for horizontal stabilizers and elevators. They only carried vertical stabilizer and rudder, and the rocket motor was located directly beneath the rudder.

The Me 163 is said to have fuel for eight minutes of powered flight only, but can stay in the air for about half an hour, performing as a very fast glider in the meantime. The armament consists of a total of six single-shot rocket tubes in the wings, augmented by one automatic cannon in the nose.

The design can be traced back in a straight line to experiments made in Germany as early as 1928—they were then seven-foot models with a Sander powder rockets—but it also reflects "page 280 in my book, if the Herr Oberst will be good enough to look." The Me 163 embodies most of Oberth's idea of what a rocket airplane should be like—as modified by an experienced aerodynamicist.

The fuel for the propulsion rocket has been described as giving off "chemical fumes" by American pilots. This sounds strange, because the exhaust of an oxygen-gasoline rocket motor would smell like any exhaust, and the smell of alcohol of an oxygen-alcohol rocket motor is hard to mistake.

Is the rocket motor of the Me 163 the place where Sander's "liquid powder" was finally utilized? Not a single word was ever written about it after that first publication—and that was in a provincial newspaper. Did the *Reichswehr* step in then and there and put its hand over the new invention, hiding it from sight?

Winston Churchill, reporting to the House of Commons on July 6, 1944, referred to Peenemünde as "the main experiment station both of the flying bomb and the long-range rocket." In the same speech he stated that "at first our information led us to believe that a rocket weapon would be used"—but then V-1 came.

The mystery of V-2 deepened.

It was an enormous puzzle.

There were the stories that Oberth was responsible for the founding of Peenemünde. There were the stories of gigantic rockets, but full of technological nonsense. There was V-1, decidedly not something Oberth would build, besides the fact that "Heinz Bunse," Georges Claude and at least four other people were alternately given credit for the invention.

V-1 lived up to some of the early reports as far as range, weight of bomb and the possibility of launching it from airplanes were concerned. But V-1 was not a rocket. Was all the rocket talk a mistake?

When Churchill spoke of "flying bombs *and* long-range rockets" it became clear that there was such a

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thing. But what did "long range" mean? Twenty miles is long range for a rocket, even ten miles would be long range.

Besides what good would a long-range rocket do as far as the Germans were concerned. Another area weapon? Another means of haphazard bombardment?

Like Arthur Clarke of the British Interplanetary Society I found myself torn between two wishes. As far as the war was concerned, or rather the needless suffering of the people who might fall victims, the better hope was to discount all the German propaganda stories as propaganda. But as far as the future of rocket research was concerned a twenty-ton rocket with a range of a hundred miles or better, would be a definite trump card. One would be able to point at that weapon and to say: "See, it can be done! But you didn't believe it!"

Yes, it can be done.

V-2, looking and performing precisely as rocket theory had always stated it would, is a reality.

Churchill, again reporting to the House of Commons on November 10, 1944, stated: "For the last few weeks the enemy has been using his new weapon, the long-range rocket, and a number have landed at widely scattered points in this country."

Information about the rocket itself was forthcoming quickly. Allied airmen saw one take-off, describing it as a streamlined projectile about forty feet long and fifteen feet around, shooting a thirty-foot flame out of its tail and followed by a long trail of vapor, described as looking "like a Bronx cheer in smoke."

V-2 carries a warhead holding twenty-two hundred pounds of high-explosive, possibly the same warhead as V-1. Its maximum range with that warhead is around three hundred miles, the peak of the long trajectory is between sixty and seventy miles above the ground. The fuel, reports say, is either gasoline or alcohol and liquid oxygen.

Everything about it spells out OBERTH in capital letters.

That it is not an effective war weapon goes almost without saying. A weapon which lands "at widely scattered points" is only a terror weapon but nothing which can decide a war. And if, as Churchill suggested, the range is increased by cutting down the weight of the warhead, the scattering is going to increase too. Besides the warhead is even less effective as it is when carried by a V-1. V-2, crashing down from its stratospheric altitude of seventy miles, buries itself deeply before the warhead has a chance to explode. It has more penetration by far where it hits, but the lateral blast effects are considerably smaller.

If you calculate the mass-ratio requirements for such a trajectory and for liquid fuels which may be expected to produce an exhaust velocity of about sixty-five hundred feet per second, you arrive at about 6.5 : 1. The warhead weighs one ton, the rocket itself cannot very well weigh less than a ton, so that

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the "weight of arrival" is two tons. Multiplied by the mass-ratio required we find a take-off weight of thirteen tons. This checks well with Allied estimates and German announcements, which both ascribe to V-2 a minimum take-off weight of twelve and a maximum of fifteen tons.

V-2 proves that it is possible to build liquid fuel rockets of almost any size. There are stories of experimental models which had a take-off weight of fifty tons. These might be just stories, but they also might be true. It does not matter too much one way or another because V-2, as it exists, proves that Oberth and his associates succeeded in making the one invention on which the whole future of rocket research and rocket construction rested. They must have invented a light-weight, high-capacity fuel pump. With such pumps you can, theoretically, build any size of liquid fuel rocket beyond a certain minimum size.

With such pumps you can, given a little time, even build a spaceship.

As a matter of fact, this is no longer in the future, the first spaceship has been built already, only it is not used as such. Yes, we might as well admit it, V-2 is the first spaceship.

With its eight and a half tons of liquid oxygen and about four tons of alcohol V-2 lifts a "payload" of one ton—the bomb—to an altitude of seventy miles. Presumably it is fired at an angle of about fifty degrees.

Now take off the bomb and substitute an observer, wearing a light diving suit and having a nice set of instruments around him, making a total of, say, three hundred pounds. This gives you another nineteen hundred pounds of fuel. Do that and fire V-2 vertically, it is not apt to have a maximum acceleration surpassing three or four G. It will ascend beyond two hundred miles—it will just touch empty space!

It will probably be necessary to re-create V-2 after the war for this purpose. We cannot hope to take Peenemünde or any one of the subsidiary research stations. The Nazis will see to it that everything will be utterly destroyed before we get there. And Himmler, I am sure, has lists of all those who know a good deal about this work. If they escape future Allied bombings, they will be shot by the Gestapo.

Barring miracles we will not be able to continue for peaceful purposes what the Germans started with war in mind. But the recreation of these things can be undertaken with confidence after the war, because Peenemünde proved that it can be done.

THE END.

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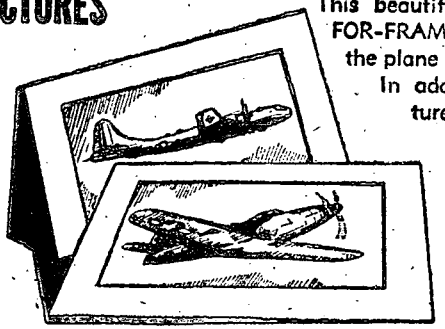

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It Isn't So Easy

by J. J. COUPLING

***Concerning** heat rays, burning lenses, and why you can't burn anybody at a distance with plain, ordinary heat. Seems a pretty complete proof that a heat ray, whatever it may be, will* not *be a ray of heat.*

From tales of Syracuse to Astounding, the heat ray is still with us. It was told of Archimedes way back when, and John W. Campbell Jr. reprints the story still, occasionally, told of the young Archimedeses of the future. Certainly the heat ray deserves attention, although perhaps not so much as it has received, and of not quite the same sort.

Now the greatest weakness of most science-fiction is its qualitative character, while the glory of science is its quantitative character. I don't mean just reeling off names of large numbers connected with interplanetary travel, but fitting figures together into a pattern. I suppose an astute mathematician could find things to calculate concerning even Bergenholms, but I also have a suspicion that the calculations would, as some say, prove sterile. So we might add that the pattern should concern the real world we know.

Of course a few trail blazers have done a good deal toward putting quantity into Astounding. Jack Hatcher tackled the food problem in space flight. Malcolm Jameson and R. S. Richardson have done considerable for space flight itself.

But why choose the problem of space flight to start with? It's a thorny one, as any reader of Oberth will agree. The spaceship is acted on continually during flight by the attraction of many masses moving in complicated orbits, as well as, at the end of its journey, by frictional forces—even if it cracks up on a meteor in transit. Before we set out to be quantitative, we may well ask, what could be simpler? And one of the answers is, of course, heat.

Einstein says that heat is subject to gravitational attraction. As far

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as we are concerned, so what? The effect on our heat ray is negligible. Some may worry about the exact nature of radiation; as far as we are concerned, it's energy, and it travels in nice straight lines. Moreover, all the problems we will encounter have been solved long ago by people interested in building telescopes or microscopes or furnaces or refrigerators or vacuum tubes. It's a cinch, boys.

But here I might inject a word of caution. What is said here will, I hope, sound very simple, reasonable, and inevitable. Don't be fooled; the answers don't come from reason alone, even if they may seem to. And I may tell a few white lies here and there, to simplify things. With this warning, let's turn on the heat.

Consider Archimedes first, the alleged father of the heat ray. During the siege of Syracuse, Archimedes is supposed to have used burning mirrors to fire the Roman ships when they were within bowshot of the walls. That should mean more than one hundred feet away, even if the Romans were very bad archers indeed.

Now to get a quantitative grasp of this problem, consider how hot the sun makes things. If that's a bad way to put it, let's come to the point. Suppose we have a nice flat level square foot of ground. At what rate does it receive heat from the sun? Well, that depends first of all on how high the sun is in the sky.

Imagine that a beam of sunlight comes down making an angle with a plumbline, as shown in Figure 1, and falls on a level area. We see that the area the sunlight falls on is considerably wider than the beam of light, and that the light is spread over a wider area as the angle becomes greater. In fact, examining

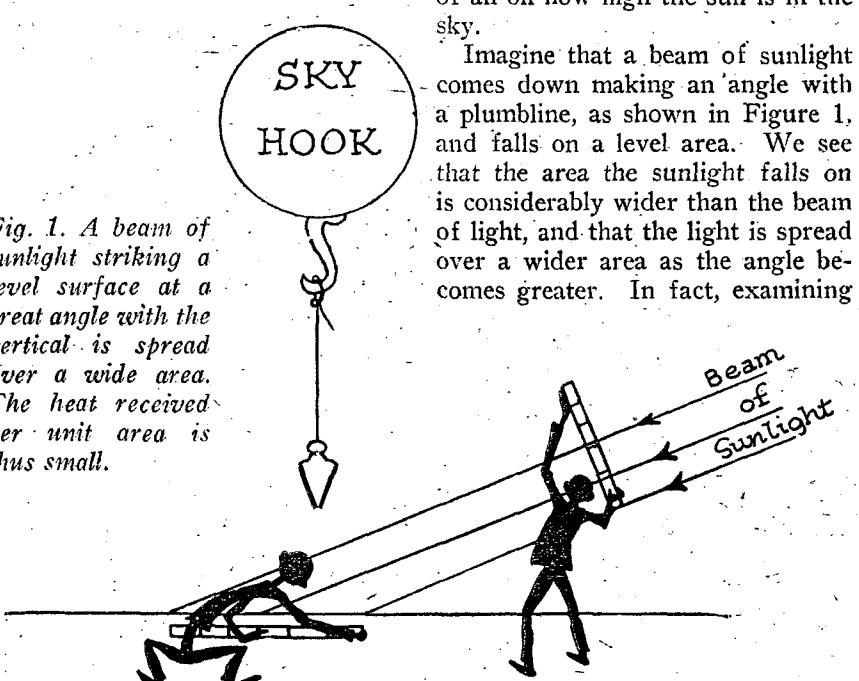

Fig. 1. A beam of sunlight striking a level surface at a great angle with the vertical is spread over a wide area. The heat received per unit area is thus small.

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the figure, we see that the light is spread over the least area at noon, when the sun is highest in the sky, and at sunrise and sunset the beam of light is spread over an infinitely wide area. Thus the rate at which heat is received by a unit horizontal area is greatest at noon and goes to zero at sunrise and sunset. To simplify things we will imagine that the sun is directly overhead.

Now imagine the sun's diameter is doubled, making the area of its disk four times as great. How much more light and heat will be received from it? One guesses, four times, and that is pretty close in case of the sun, because its apparent angle is pretty small. We might get in trouble if we assumed that this held no matter how big the sun was. In the first place, doubling the width

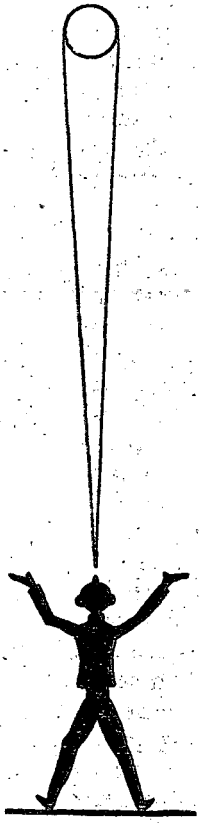

Fig. 2a. The Sun's rays are pleasantly warm when coming from a narrow angle—

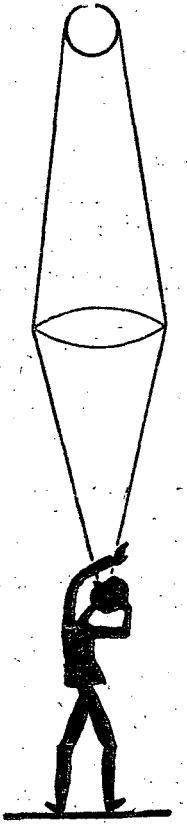

Fig. 2b. —but unpleasantly hot when coming from a wide angle.

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of a wide body doesn't double the angle it subtends. Further, for a very wide body, the light and heat from the edges come down at a considerable angle, and we have just seen that this reduces the rate at which heat is received.

This all fits in with our common sense in another way. For the sun to be seen over a whole half of the sky it would have to have an infinite diameter or be infinitely close, and under these conditions the heat received is not infinite, however large it may be.

But how does the distance of the sun come into the picture? The answer may seem surprising at first, although not at second thought. The distance doesn't come in directly, but only in connection with the diameter, in determining the angle of the sky over which the sun is seen. We don't need to know the distance itself in considering how much heat the sun supplies. All we need to know is how hot the sun is and how large it appears: that is, the angle of the sky it appears to cover. To convince ourselves of this, consider the following case:

Suppose two objects are red-hot, the same red. We place one just behind the other, so that they overlap to our vision. Regardless of shape, they both appear equally bright, and we can't distinguish the boundary. Now suppose we move one further away, still keeping them overlapping. You will guess that they still seem equally bright, and that we still can't distinguish the boundary. The same holds true if we see one of the objects through a perfectly reflecting mirror or a perfectly transparent glass. The form or grind of the glass doesn't matter; that may change the shape but not the color of the object. That's why optical pyrometers work. In them a hot filament in the eyepiece of the telescope is compared with a distant object. The temperature of the filament is adjusted by passing current through it so that the boundary between it and the object whose temperature is to be measured can't be distinguished. From all this we infer that the same holds true for the entire radiant spectrum, including rays that transmit heat energy but no visible light.

Now we see why the distance of the sun isn't the primarily important thing. All that matters is (1) its apparent size, or the angle it appears to span; (2) its angular position with respect to a line drawn perpendicular to the surface illuminated; (3) how hot it is. What this "how hot" means we'll discuss later. And we will ignore (2) and assume the rays strike the surface perpendicularly, heating it with maximum effectiveness.

What does a burning glass do? A popular expression is that it concentrates the rays of the sun. This is true in a sense and misleading in another sense. I prefer to think of a burning glass as enlarging the angle over which heat reaches the object to be heated and an—I hope—hypothetical observer on it. A glance at Figure 2 will make the idea clear. The poor observer in 2b sees the sun in a good part of

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the sky; the sun, in fact, seems to cover the entire burning glass, and is just the same color, brightness, or hotness, as for the observer in 2a. No wonder 2b is a little bit droopy.

The beauty of this picture of the burning glass is that it tells us just what to do to make a good burning glass. Making the burning glass larger won't necessarily help. The burning glass has to focus the rays of the sun into a cone of a very obtuse angle, so that they converge in a large angle. At the point of convergence is, for distant objects such as the sun, just the focal length from the lens, what we need is a lens with—yes, you photographers have guessed it—a small *f* number.

But we don't need a good resolution. It doesn't matter what part of the sun we see through what part of the lens; it's equally bright all over. So ingenious promoters of the past, who used burning glasses to burn up diamonds and to melt rubies for the amusement of kings and such, built them as shown in Figure 3a, so that the lenses would not be inordinately thick and heavy. Even more ingenious physicists at the California Institute of Technology used a more elaborate arrangement of the sort indicated in Figure 3b in constructing a solar furnace. Here light and heat from many lenses reach the—now defunct—observer from many directions, over a very large angle. Of course in the actual solar furnace there were many lenses, not just three as shown in Figure 3b.

If a burning glass could be made so that light came from half of the sky, the observer would—neglecting atmospheric losses—receive heat just as fast as if he were at the surface of the sun. If light and heat reached him from all sides, as is possible with the arrangement of Figure 3b, he would receive heat twice as fast, just as if he were immersed in the surface of the sun. He wouldn't notice the difference.

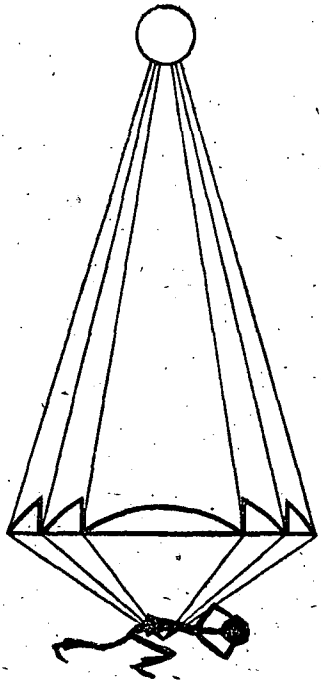

Fig. 3a. The Sun's rays coming from a very wide angle are insupportable. (Fresnel lens.)

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But haven't we got away from Archimedes and his sun-driven heat ray? I hope not. And I promised quantity, too. I meant to do some experiments on a hot sunny day, but it's a little early in the year for best results. However, Figure 4 shows an "engineering estimate." I estimate that the lens shown in 4a has about as high an *f* number—*f* 4, by the way—or, as small an angle of convergence, as will do any serious damage in a reasonable time. Now the picture in Figure 4b shows a ten foot mirror and a distance of one hundred feet. This is *f* 10. As the angles are small the rate at which heat is received varies just about as the square of the apparent angular diameters, and this is also inversely as the squares of the *f* numbers. In other words, a given area on the ship receives heat at only about one sixth the rate that the same area would receive heat under an *f* 4 lens. I think this is quantitative enough to settle the matter of Archimedes' burning mirrors in the negative, even though Alley Oop did see them with his own eyes. It also settles the hash of a lot of story writers—including Edgar Wallace, if my recollection doesn't fail—who have their characters heat distant objects, sometimes even to burning, with pocket lenses.

Or am I a pessimist? How small an *f* number is needed to burn things up? Perhaps a reader more fortunately situated than I am will perform the experiment. All he needs is a warm clear day with the sun high in the sky and a camera with an *f* scale on the diaphragm adjustment. Put a piece of paper in place of the film—about the right comparative thickness to represent wood with a ten foot lens—open the shutter and point the camera at the sun. Then open the diaphragm until the paper chars and read the *f* number required for this.

But isn't there any way to accomplish for sure what Archimedes

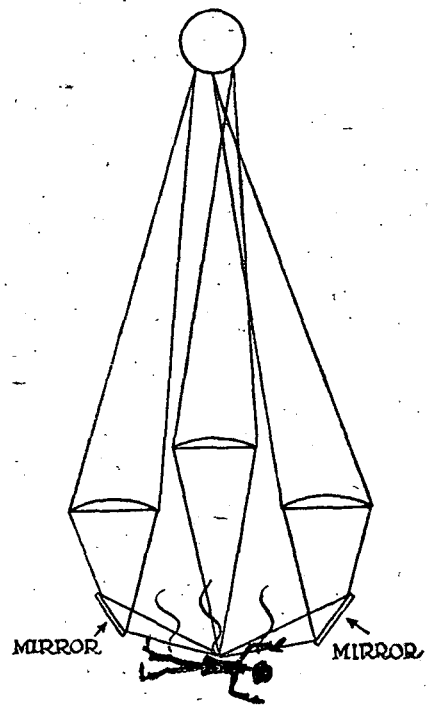

Fig. 3b. And from a still wider angle, they would be still worse. (C.I.T. Solar Furnace.)

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is said to have done? Certainly! A football bowl provides the ideal setting. Imagine each student equipped with a large cardboard square covered with tinfoil, and each seat occupied by a student.

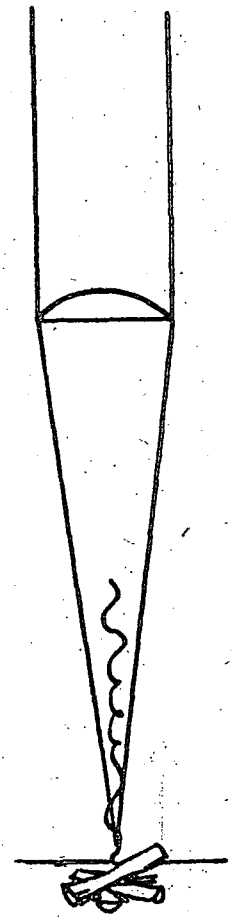

Fig. 4a. Burning glass—approximate F4.

The referee would have the sun in his eyes almost wherever he looked. Would he be burned up! Would the reflectors have to be concave? If they are far enough from the referee to seem smaller than the sun, it doesn't matter.

At about this point some intelligent reader is going to balk badly, and point out that after all, many stars are hotter than the sun. And by holding his eye at the focus of a lens, he can see the star over the whole lens. If the important things are just the hotness of the source and the angle over which it is seen, why doesn't the star blind him? Well, there is a joker here, or rather, two jokers. First, of course, the total amount of heat received is too small to do any damage. But the reason the heat per unit area is not very high is that the image of the star is spread out because of the wave nature of light, which isn't important for large objects and large images, but is for very small ones. The rule for when we can apply our way of looking at things is, when the area over which the light and heat fall is large compared with the wave length of light. That holds in most cases we're interested in.

But what about man-made heat rays, in which we don't rely on the sun as a source? Let's suppose we think about spaceships. First, it's interesting. Second, it's easy, because the ships are in a vacuum and lose heat by radiation only.

Now all objects radiate heat, at a rate determined (1) by their temperature and (2) by their "emis-

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sivity." Black objects radiate readily, or have a high emissivity. Shiny objects radiate slowly, or have low emissivity. The emissivity is the same for both radiating and receiving heat. If a body radiated heat more readily than it absorbed heat, it would get colder and colder. If it absorbed more readily than it radiated, it would get hotter and hotter. The "one-way" glass described in some science-fiction would accomplish this.* Surrounding a kettle with it, the kettle could, without radiating heat away, absorb heat from an ice field, and so could boil in the midst of a glacier. Then we could run a steam engine from the kettle if we liked, and that's perpetual motion. It's a shame authors waste one-way glass on the trivialities of spying. Since perpetual motion doesn't happen these days, we may take it that emissivity for receiving heat is equal to that for radiating heat.

We'll have to take it for a fact also that the heat radiated per unit area per unit time varies as the fourth power of the temperature above absolute zero. Doing so, we can make a very simple calculation about how hot a heat source we must have to heat a spaceship hot enough to kill its occupants—say, 100° Centigrade; that would boil them. All we have to do is to find the rate at which a body loses heat at 100° C. Then we find the rate at which it receives heat from the assumed source as a function of the temperature of the source. We then find the temperature of the source for which the heat supplied will equal the heat lost.

Suppose we make this calculation for the following case: The heat ray comes from a mirror twenty feet in diameter and is directed at a spaceship a mile away. The source of heat is dead black. The emissivity of the spaceship is the same all over. We find that to raise the spaceship to a temperature of 100° C, the source must have a temperature of 15,000° C, or three times as hot as the sun! This means it must radiate per unit area eighty-

*I mean real one-way glass, which doesn't depend on the trick of looking from a darkened room into a brightly lighted one.

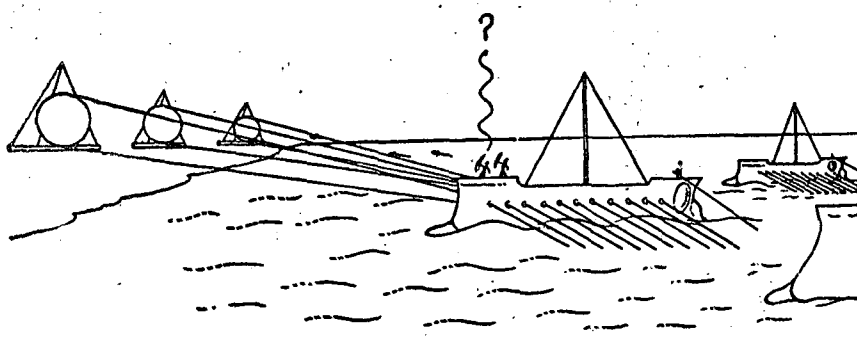

Fig 4b. Archimedes style heat ray, or burning mirror—F10, at best.

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one times as fast as the sun. Imagine the difficulty of hanging that in a lantern!

Of course, making the mirror larger would help, but moving the ship further away would hinder. A mile is a pretty short range for space war. And if the attacked vessel were half shiny—toward the heat ray—and half black—away from the heat ray—the effectiveness of the heat ray would be just about zero.

A friend of mine objected that this calculation is pessimistic; that the thing to do is not to heat the whole ship, but to concentrate on one spot and melt a hole in it. This argument is fallacious. We can easily see that cooking the occupants is the easiest thing to do.

First of all, the impractical feature of the heat ray is the immensely high temperature required at the source. Now, the heat received *per unit area* of the ship depends on just (1) the temperature of the source, (2) the square of the ratio of the diameter of the reflector or lens to the distance from the ship attacked.

Second, for a given heat per unit area—given source temperature, reflector size, and distance—the attacked ship will get hottest at *any* point if the heat beam is wide enough to cover the *whole* ship.

We might add: Third, after the heat ray is turned on, the attacked ship will gradually approach its final temperature. If the heat ray is turned on for a short burst only, no part of the attacked ship will get as hot as if the heat ray is left on for quite a while.

Isn't there any hope for heat rays? Well, not just as such. Heat is disorganized energy; that is, energy of many wave lengths. The rules of optics which we have used apply only to such disorganized energy. A radio antenna can send out a sharp beam of energy at one wave length even though the beam may be wide and fuzzy if a broad band of wave lengths, analogous to heat, must be transmitted. A tiny loop antenna receives more energy at a single wave length than it has any right to on the basis of its area alone. If heat rays are to be effective, they must presumably be single wave-length beams. But then they should be called "energy beams," not heat rays, and that's not what we set out to discuss.

THE END.

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Brass Tacks

He may have something there!

Dear Mr. Campbell:

Concerning Messrs. Smith and Long's embarrassing faux pas which was revealed in the February issue of Astounding, it seems to me that they could have avoided a lot of trouble if they had investigated the wave mechanics of the radiations involved. The possibilities admitted by the energy equation

$$E = \frac{Mo\ C^2}{\sqrt{1 - \frac{c^2}{v^2}}}$$

are tabulated below.

Radiation Type	V	Mo	E	Particles
de Broglie waves	<C	real & finite	real & finite	atomic & subatomic particles, especially electrons
light, electro-magnetic radiations	C	0	real & finite	photons
gravitic radiation?	>C	real & finite	imaginary	gravitrons?
Venus Equilateral solar beam?	>C	imaginary	real & finite	———
———	<C	imaginary	imaginary	———

Just as an electron may have any speed between zero and C, so may a gravitron have any speed between C and infinity, depending on its energy content and frequency ($v = E/h$, where V = frequency, and h = Plank's constant). Other considerations show that a charged particle must have a velocity less than C. Therefore, gravitrons can have no charge. An expert in the field of wave mechanics could undoubtedly predict other properties of gravitic radiation and the solar beam. Only a born pessimist would predict that science will never be able to solve the problems of imaginary mass and imaginary energy and frequency involved in these radiations.—Edward Conroy, 606 W. Ohio Street, Urbana, Illinois.

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More people may mean more thought.

Dear Campbell:

I would like to suggest another factor besides the technical growth mentioned by George Gallagher and the speedy communication mentioned by you, to explain the acceleration of historical change.

The Haskin Information Service supplies the following information: Before the fifteenth century, the population of Europe hardly exceeded 50 million. More recently there are the following estimates:

1762: 130,000,000
1809: 175,000,000
1850: 255,000,000
1886: 345,700,000

The latest figures for Europe say 400,000,000, plus 170,000,000 in the USSR. To this should be added much of the 185,000,000 in North America, 88,000,000 in South America, and Australia's 9,000,000, to make a total population for the western world of some 850,000,000. I'm not concerned with comparing this to the rest of mankind, but want to lay it up alongside the 50,000,000 population of the Occident in the Middle Ages, and probably smaller populations of the Roman and earlier empires.

This tremendous growth of population is partly due to the discovery of empty lands overseas, but much more to the Agricultural Revolution — (which began somewhat earlier than the Industrial)—and to advances in medicine. It is unprecedented.

Of course there are many other factors besides number of people influencing the speed at which civilization develops. But I think the evidence is overwhelming that large communities change faster than small, isolated ones. The more scientists you have working on technology, the swifter the advances will come. And by the same token, the more philosophers, students, printers, politicians you have, the quicker the public mind will change. If there had been 300 million literate people in Europe during the Middle Ages, someone would quickly have emerged to point out the extreme limitations of Aristotelian logic which the schoolmen wasted centuries poring over. Had there been 50 million literate people in the British Isles in the seventeenth or eighteenth century, the progression of thought from Thomas Hobbes to Thomas Paine might have been compressed into a decade, though doubtless it was urged on to some extent by historical events.

In passing, this casts doubts on a claim to perfection which is based on the great age of an institution. From the fourth century to the Reformation there were about half as many man-years lived in the European world as there have been from the Industrial Revolution to date. Centuries aren't enough; you have to fill them with something.

Any survey of modern history must find the storm-times becoming more frequent. Two hundred years from the sixteenth century expansion to the revolutions around the end of the eighteenth century, about a hundred from Metternich to the beginning of our present unsettled

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period. And the great sweep of the nineteenth century would have been called a continuous revolution by a scholar of the Middle Ages. If the accelerating forces continue to increase in power, does it mean that the world will never settle down again, that the future will be what we would call a continuous revolution?

Population expansion seems to be drawing to a halt in western Europe and the northeastern United States. I don't know what the psychological causes are, but there is no necessary economic reason for it. Large parts of South America are just being opened up. We hear of the Soviets expecting 250 million in the next century, Australia raising its sights to 50 million. Hydroponics aside, the United States can support twice its present population. And I don't have to say where the expansion can go after that.

Growth of population sems to be in the cards until a time about which we can't guess. If such growth is linked to social change, the momentary expectation of a socio-economic-political system that will endure may be illusory.—Jack Speer.

The nice friends in the white coats will explain it better, we hope.

Dear John W:

In defense of my concept of C^2, I have been doing considerable intense study and research in symbolic logic and abstract mathematics and I find sufficient evidence to refute all disclaimers pertaining to my concept of the speed of light squared. This evidence I will try to impart in shortened form, which is necessary since the entire discussion would take some fifteen thousand words and would be so complex as to make uninteresting reading. Furthermore, I doubt that more than six or seven of your readers could possibly understand it.

However, in simplified form, it is thus: If you define your parameters, you may express either concrete or abstract concepts in terms of one another. To imply that any abstract concept is not real is to imply that any concrete abstract can not be abstract. To claim that it is impossible to reduce a purely abstract mathematical identity to a practical, concrete expression. Nor would it be permissible, when the borderline between the abstract and the concrete. On the other hand, this borderline may never be completely defined, in which case, the gradual change from one to the other takes on the concept of a continuously variable, always moving, never ending frame of reference that extends from, on one side, the pure idea and on the other side, the practical machine. Furthermore, since no practical, arithmetical, or concrete concept may exist without the accompanying theory, which is the same as the idealistic, abstract concept it must be possible to explain one in terms of the other, since if this were not possible, you would find yourself arguing that things that are concrete must be illogical, and conversely, things that are logical can never be concrete!

Now all of this is very simple.

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If you perform the symbolic manipulations in some mechanical medium, you will find that the laws defining logic are reduced to a mechanical plane, and then the frame of reference becomes any set of parameters you wish to set up, providing that these temporary physical laws are compatible. Once this is done, the ultimate reasoning behind all manner of purely abstract thinking becomes clear, and the idea of expressing a concrete term in unreal, abstract numbers is possible. Furthermore, terms expressed in this manner have real definitions, which, of course, will depend upon the parameters set up in the individual frame of reference that has been obtained to manifest the compatible physical laws, and with no trouble at all you may then change the physical laws in small increments until you approach either zero, infinity, or in this case, you approach the true, physical frame of reference in which we live. Since the laws are functions of the concept—and vice versa—the concept as the function of the laws deviate, and when the frame of reference becomes equal to our own, real physical existence, the concept. A definite bearing on the case, and also a definite, concrete connection with existing physical.

However, since an abstract thought has no real arithmetical meaning, the concachinnation of laws behind this abstract thought need not, and at this point, the relationship between the abstract and the concrete becomes cemented into unity.

This is not only basic, it is fundamental.

In closing, I wish to express my deep gratitude to Mr. and Mrs. Joe Calderon. Three of their very closest friends assisted me in putting the extremely complex thoughts into concentric form so that this letter could be written without being unintelligible. These friends of his did all in their power to help, and have become quite attached to me. I do not care to hurt their feelings, and especially do not wish to offend Mr. Calderon, but I wish he'd take them away.—George O. Smith.

Sometimes slips do get by—particularly, as in this case, when the author does any considerable rewrite job on the yarn.

Dear Mr. Campbell:

I have been reading Astounding steadily for some five years now and I finally thought it about time that I wrote to you in praise of the magazine. I have read many other SF magazines, but, somehow, I always return to Astounding as I believe it to be better than any of the others I have read to date.

I just finished reading "Nomad" and this very excellent story prompted this letter. I enjoyed the story very much and I think it one of the best serials I have read. But—one or two points bothered me in the story. In the second instalment, on page 167, January 1945 issue, a certain Sector Commander, Hamilton by name, is impaled through the throat by the captured

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Mephistan. Then, two pages later, the same Hamilton comes back from a raid, apparently none the worse for wear. How come?

The other little slip I noticed occurred in the last instalment. On page 81, Guy Maynard reluctantly abandons his ship, the *Loki*, and goes on in a tiny lifeship, in which he lands on Ertene. Then, on page 158, Maynard takes off from Ertene in the *Loki* which had been left in the Solar System, headed for Mephisto.

Now these errors may seem trivial, but I'll bet that I am not the only one who spotted them. However, as I said before, I enjoyed the story tremendously. There is plenty of room for thought there. Perhaps Mr. Long could follow it up sometime with the further trials and tribulations of Ertene and the Solar System.

Could you give me the dates of the issues which contained the first of the "Lensman" series. I now have, by dint of persistent searching in 1943, the complete set of issues containing "Gray Lensman" and "Second Stage Lensman." I would like to procure the first story in the series if I can. While I was getting "Gray Lensman" I also got both ends of "Sixth Column." It was very disconcerting to have only the middle of the story and I was glad to be able to find the rest of it.

The articles are very interesting to me, especially those by Dr. Richardson. These interest me especially because I am an amateur astronomer myself. I have

HE GOT THE PURPLE HEART...

WILL A BOND PROVE TOO COSTLY FOR YOU?

It's left to your own conscience, because that's the kind of country we are. Somewhere else in the world, the money needed to carry on the war would be gotten through added taxes, compulsory savings. But not here. Because we're still free . . . and it's still up to you—and no one else—to decide whether or not your country, or your boy, is worth another bond.

BUY IT NOW!
THE WORLD'S
BEST INVESTMENT!

WAR BONDS

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built a six-inch reflector which, unfortunately, I have used only a little, mainly because of living in Chicago. I have no proper place to set it up and therefore I lose much of the satisfaction I should get from it. The "brownout" which starts next month will help me and others who have telescopes in the big cities to experience better seeing because of the decrease in extraneous light.—John A. Harlan, 6826 Ridgeland Avenue, Chicago 49, Illinois.

You might package the scraps and sell them for use in motorless household vacuum cleaners too.

Dear Mr. Campbell:

As a producer or fabricator of vacuums and vacuum products you should be interested in our new line of machines for 1945. It embodies all the newest developments and each item is designed and built with our customary thoroughness and attention to detail. A brief listing is given here. For further information please write us, stating your particular requirements.

IRRADIATOR Cat. No. C3-6843 Irradiates vacuums with vitamin mu, making them especially suitable for high-mu tubes.

Code word SLOTH $1492.95

PUNCH PRESS Cat. No. C3-2685 Especially designed for punching deep holes of small diameter, such as those for grid leads. Die sets can be furnished for holes of all sizes and shapes.

Code word UNITE $985.00

EYELETTER Cat No. C3-1313 This handy little tool punches a ¼" hole and inserts a brass eyelet for hanging up finished vacuums to dry. Also good for anchoring vacuums in Lenard Ray tubes, Skiatrons, et cetera.

Code word MOSEY $29.50

WASTE RECEIVER Cat. No. C-3-1066 Don't let vacuum scrap lie around to get in your eyes, ears, hair, et cetera. This can has an air-tight, foot-operated lid and holds about fifty pounds. Cadmium plated finish will resist even hard vacuums.

Code word FRISK $12.95

COLD MILL Cat. No. C3-3050 For rolling slabs of vacuum to strip of just the right thickness to slide easily between grid wires. Complete with automatic shear.

Code word UBETI $1,500,000.00

BENDER Cat. No. C3-4217 Automatically makes the complex bends in strip vacuum for multi-grid tubes.

Code word NOWED $625.00

Above prices are for 60 cycle AC. Add twenty-five percent for 25 cycle AC and fifty percent for DC.—William M. Danner, United Vacuum Fabricating Machinery Co. (Not Inc.), 720 Rockwood Avenue, Pittsburgh 16, Pennsylvania.

* * * * * * * * *

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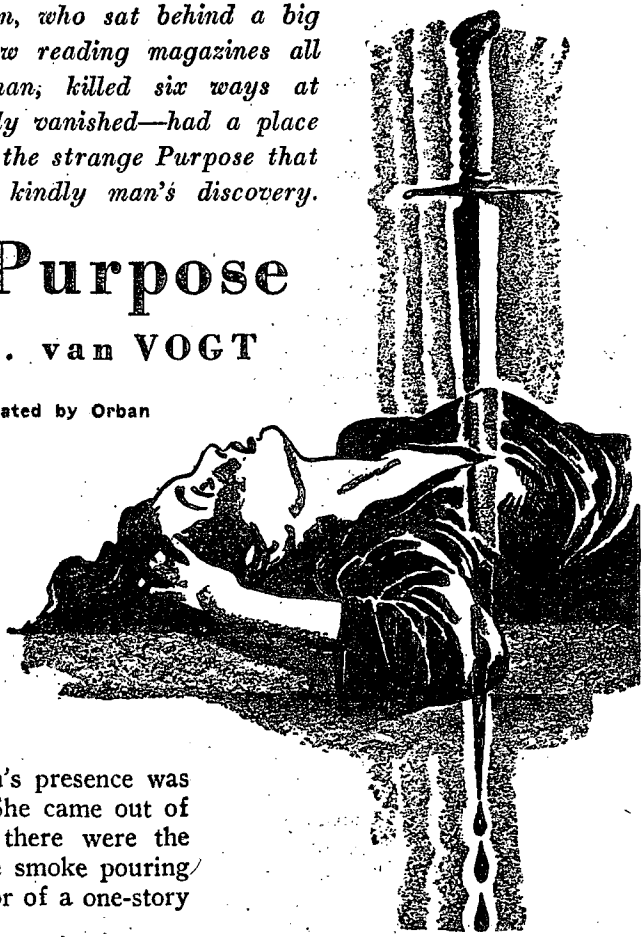
A weak little man, who sat behind a big glass store window reading magazines all day—and a woman, killed six ways at once, and her body vanished—had a place and a meaning in the strange Purpose that stemmed from a kindly man's discovery.

The Purpose

by A. E. van VOGT

Illustrated by Orban



Virginia Mention's presence was quite accidental. She came out of a restaurant, and there were the fire trucks, and the smoke pouring out of the open door of a one-story building.

Virginia walked over, her reporter's instinct vaguely roused. Fires were long since out of her reportorial field, except that she was on the scene of this one. She visualized the tiny stick she would write:

Fire of so and so origin broke out this morning on the premises of thingumajerk. Slight damage.

The sign that hung out in front of the building read:

FUTURIAN SCIENTIFIC LABORATORIES
NEUROLOGICAL AND ORGANICOLOGICAL RESEARCH

She wrote that down, and the number, 411 Wainworth Avenue. When she had finished, the firemen were stamping out of the door.

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Virginia grabbed the chief by the arm.

"I'm from the *Herald*. I happened to be passing. Anything important?"

The chief was a big, clumsy man, slow of speech.

"Naw. Outer office furniture. Boss not in. Fire seems to have started in a wastepaper basket from a cigarette stub."

He went on, grinning: "The receptionist in there is a queer young drip. Never saw anybody so scared in my life. He was gobbling like a turkey when I left. Didn't speak a single understandable word."

He chuckled callously: "If that's the way he feels now, I can imagine what he'll be like when the boss arrives. Well, so long."

He walked off to his car.

Virginia Mention hesitated. Actually, she had all the information she wanted. But there was such a thing as personal curiosity. She walked over to the still open door.

It was a small office that she peered into. It contained three chairs and a streamlined counter in blue and white. That is, it had been blue and white. Now, it was a half charred mass, made uglier by the water that had been ruthlessly poured on it. Behind the counter was an electric adding machine of some kind.

Behind the counter, also, was the receptionist.

Virginia's mind suffered a considerable pause. The young man was tall and very thin, and he wore clothes that were too short for him in length and too wide for him in width. His face was hollow-cheeked and colorless. His chin, his forehead and his neck were covered with pimples, and he had an Adam's apple that kept moving and bobbing.

The apparition stared at her out of big, brown, terrified eyes. Its lips parted and spluttered gibberish at her. At least it would have been gibberish to anyone unaccustomed to the mumblings of editors and interviewees.

Virginia Mention translated aloud, transposing the pronoun: "What do I want? I'm a reporter. What's the value of the furniture?"

"Ubble dubble dow," said the young man.

"Don't know. Hm-m, looks like a pretty complete mess, except for that comptometer, or whatever it is you've got behind the counter. I think I'll just put: 'Damage to office furniture.'"

She wrote, then closed her book with a snap. "Well, be seeing you."

She intended to turn away and leave. But there was an interruption. A buzzer sounded. A man's deep, quiet voice said from some indeterminate point in the wall behind the young man:

"Edgar Gray, press button 74."

The young man galvanized. For a moment, he seemed to be all arms and long legs, leaping behind the counter. Somehow he untangled himself. One of his long, bony

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fingers touched a button on the "comptometer".

He stood then, eyes closed, pressing it down. Virginia had thought his face was as colorless as it could possibly be. But now it blanched, and visibly grew paler. A curious darkness seemed to creep over it finally, as if the half-life of the young man's body was suffering a great defeat.

The effect, the impression, was unnaturally sharp. Virginia stared blankly.

A minute passed; and then slowly the ungainly creature drew a deep breath. He took his hand away from the button. He opened his eyes. He saw Virginia. A vague flush of returning color stabbed at the lines of his cheekbones.

Virginia Mention found her voice: "What on earth was that?"

She saw that Edgar Gray was too far gone even to gibber. He stared at her glassily, and she had the impression that he was going to faint. With an audible gasp, he sank down in the charred chair.

He slumped there, looking like a sick dog.

Virginia said in a kindly voice: "Look, Edgar, the moment your boss gets here, you go home and lie down. And why not try eating something once in a while. It's good for the health."

She turned and went out. And forgot about him.

She had been gone about five minutes when a woman's clear, vibrant, yet low-pitched voice said from the wall:

"Edgar!"

The gangling youth looked startled. Then, agitated, he stood up. The woman's voice said insistently:

"Edgar, draw the blinds, shut the door, and turn on the lights."

Like an automaton, the young man carried out the commands. But his hands were shaking when he paused finally, and stared wide-eyed at the door which separated the rear of the building from the front.

There was a stirring there, a vague flickering of pinpoints of light. The door did not open, but a woman stepped through it.

Through it!

Daemonic woman! Her form was indistinct, insubstantial. She wore a white gown of a flimsy, transparent material. For a moment, the door was visible beyond her, through her.

She stood there as if in some strange and unearthly fashion waiting for physical completion.

Abruptly, she was no longer transparent. But whole. Real. She walked forward. Her hand came up, and slapped his face, hard.

He half staggered, but managed to keep his balance. He began to whimper, tears of chagrin and hate.

"Edgar, you were told not to smoke."

Again, the hand came up. Again, the resounding slap.

"You will remain here your

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usual time, and perform your duties. Do you understand?"

The woman stared at him bleakly. "Fortunately, I arrived in time to see that woman reporter. That is well for you. I was minded to use the whip."

She turned and walked towards the inner door, paused for a moment, and then stepped through it, and was gone.

Accidents begin, and human nature carries on. Before the fire, Virginia had passed the Futurian Science Laboratories a hundred times without ever noticing that it was there. Yet now she was aware of it.

Two days and a morning after the fire, she emerged from the same restaurant with her husband. She watched him stride off towards the university, then turned and went her own way. As she came to the Futurian sign, she paused with a sudden memory. She peered through the great plate glass window.

"Hm-m-m!" she said.

There was a new counter in place of the half burnt one, and a new chair. In the chair sat Edgar Gray, reading a magazine.

She could see his blotched face, and she had a clear profile of his Adam's apple. An empty box lunch stood on the counter beside him.

It was a thoroughly normal scene; and she didn't give it a second thought. But that night at 8:10, when her husband was escorting her to the theater, she glanced out of the taxi, as it passed Futurian.

The enormous window glowed from the reflections of a spotlight behind the counter. Under the spot sat Edgar reading.

"He keeps long hours," said Virginia out loud.

"Did you speak?" asked Professor Mention.

"It's nothing, Norman."

A week later, coming home from a party at a quarter after eleven at night, their car passed Futurian. And there was Edgar under his light, reading.

"Well, of all things," exploded Virginia. "Whoever owns that joint sure has got hold of a sucker."

Her husband grinned at her. "Working on a newspaper has certainly enriched your vocabulary, sweet."

Virginia gave him briefly the sequence of her experience with Futurian. She watched his face crinkle, his fine eyes narrow with thought. But in the end he only shrugged:

"Maybe it's Edgar's turn to be on the night shift. Since the war and the absorption of returned men into the planetary services, there's been a tremendous shortage of ordinary help, as witness the fact that you are compelled by law to work; and we have to eat vitamin-less food in restaurants because you can't work and cook too." He grimaced. "Restaurants, wagh!"

Virginia laughed; then soberly: "There may be a manpower shortage, but the people who are avail-

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able are treated like tin gods."

"Uh, I suppose you're right. I'm afraid I can't help you then. As a lecturer on practical psychology, my city contacts are becoming less every day. Why not ask old Cridley in your office? He's supposed to be a good man."

Cridley, the science editor, stroked his beard. "Futurian Science Laboratories," he said. "No, I can't say that I've heard of them. Let me see."

He drew a commercial register across the desk towards him, opened it. "Hm-m-m," he said. "Yes, here it is. . . . Research. . . . Doesn't tell you much, but"—he looked up—"they're legal."

He added with a sardonic smile, "I somehow had the impression you thought they weren't."

Virginia said: "There was a vague idea in the back of my mind that they might be worth a story for the magazine section."

In a way that was true—Old Cridley was reaching for the phone. "I'll ring up Dr. Blair, the only neurologist on my list. Perhaps he can give us some information."

The phone conversation was prolonged. Virginia had time to smoke a cigarette. At last the old man clicked down the receiver. He looked up.

"W-e-e-l-l-l," he said. "You've run into something."

"You mean the place is phony."

He grinned. "No, no, the other way around. It's big. It's a ten, twenty, thirty *billion* dollar concern."

"That little place!" said Virginia.

"It seems," said Old Cridley, "there are duplicates of that little place right around the world. There's one on some main avenue of every city of two hundred thousand or more in the entire world. There's one at Canalis Majoris on Mars, and one each on the two principal islands of Venus."

"But what do they do?"

"Ostensibly, they do research work. But actually it's a high pressure organization to get people to put up money for research. Some lame attempts have been made to investigate the outfit, but so far every such attempt has died while still in the embryo stage.

"Dr. Dorial Cranston, the founder, used to be quite a man in his field. But about fifteen years ago, he went money mad, and developed this beautiful system of milking gold from soft-hearted dopes who want to help science. The key moochers are men and women whose personalities are plus and then some. They shine like jewels in a crowd. You know the type. You've got a long start in the direction of that kind of personality yourself."

Virginia let the compliment pass. "But have they ever made any worthwhile research?"

"Not that I know of."

Virginia frowned. "Funny, we haven't heard more about them. I think I'll look into it further."

It began to rain shortly after five o'clock. Virginia Mention

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retreated deeper into the doorway of Sam's Haberdashery, and stared miserably up at the sullen skies.

The idea was just beginning to penetrate that she was in for a night. Oddly, she had no intention of giving up. Logic said that Edgar ought to be watched over the supper hour.

He was going to be watched.

At seven the rain petered out. Virginia oozed out of her doorway, and paced up and down glaring at the office across the street. A light had flicked on, the same shaded counter lamp she had previously observed. Under it sat Edgar Gray reading a magazine.

"The little coward!" Virginia Mention raged silently. "Hasn't he got guts enough to stand up for his rights? I know he was in there this morning."

The fury faded with the minutes, yielded to the passing of the hours. At ten minutes after ten, she dashed hurriedly into the restaurant, gulped a cup of coffee, and phoned her husband.

Professor Mention's chuckle on the phone, as she described her vigil, made her feel better. "Personally," he said when she had finished, "I'm going to bed in another hour. I'll see you in the morning."

"I've got to hurry," Virginia breathed. "I'm scared silly he'll leave while I'm in here."

But the light was still there when she got outside. And so was Edgar.

He was reading a magazine.

It was funny, but suddenly she began to picture him there in terms of years. Day after day after day, she thought, Edgar Gray coming to work in the morning, and remaining until a tremendously late hour at night. And no one cared; no one even knew apparently. For surely self-consciousness such as Edgar carried around with him could not exist if he had a normal home life.

She began to feel sorry for Edgar as well as for herself. What a life he was leading, what an incredible inhuman life.

She watched him jump to his feet, and press down one of the "comptometer" keys.

Virginia Mention shook her head, bewildered. This business made less sense every second. Eleven o'clock came and passed. Eleven thirty. At eleven thirty-two, the light blinked out abruptly, and after a minute Edgar emerged from the front door.

It was a quarter after eight the next morning when Virginia Mention staggered up the single flight of stairs to her apartment.

"Don't," she murmured to her husband, "ask me any questions. I've been up all night. I'll tell you everything about a month from now when I wake up. Phone the office, will you, that I won't be in?"

She did muster the energy to undress, and get into her pajamas, and crawl into bed.

When she wakened, her wrist watch said 4:30—and a woman in a white evening dress was sitting in the chair beside her vanity.

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The woman had, Virginia Mention saw after a blank moment, blue eyes and a very lovely face. That is, it would have been lovely if it hadn't been so hard, so cold. Her body was long and slim, like Virginia's own. In one of her finely shaped hands, she fingered a knife with a thin, cruelly long blade.

The woman broke the silence, softly:

"Now that you have started your investigation of us, you must also bear the consequences, the rewards of zealousness. We're all very glad you're a woman. Women weigh less."

She paused. She smiled a fleeting, enigmatic smile, and watched alertly as Virginia slowly sat up in the bed. Virginia had time to think that she had seen this creature somewhere; and then the woman went on:

"Women also arouse more sympathy. . . . My dear, you've come into something you won't forget for"—she lingered over the phrase caressingly—"the rest of your life."

At last Virginia found voice: "How did you get in here?"

Except for the sense of recognition, that was actually as far as her mind had gotten. The woman's words, the enormous threat in them, would catch up to her only gradually. Her voice was shriller, as she repeated:

"How . . . into my apartment?"

The blond woman smiled, showing her teeth. "Through the wall of course."

It sounded like very unveiled satire. It roused Virginia Mention as nothing else could. She drew a deep breath—and was herself.

Narrow-eyed, conscious suddenly of the eerie quality of this meeting, she stared at the other. Her gaze lighted on the devilish knife and, just like that, fear came.

She pictured Norman coming in, and finding her stabbed to death. She pictured being dead, while he was still alive. She pictured herself in a coffin.

She began to feel warm with terror.

Her gaze flashed up to the woman's face—and terror sagged.

"Why," she said aloud, wonderingly, "I know now who you are. You're the wife of the local electrical tycoon, Phil Patterson. I've seen your picture in the society pages."

Fear was fading fast now. She couldn't have explained the psychology, except that people you knew, and people of importance didn't commit murder. Murderers were strangers, unhuman creatures who emerged briefly from a mass of meaningless faces, after the police had caught them, and, once executed, retreated into the depths of your memory, never again to be recognized.

Virginia found her voice again. "So," she said, "you're one of the Futurian Science Laboratories crowd."

The woman nodded brightly. "That's right. That's the crowd I belong to. And now—" She sat up a little straighter; her voice was

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as resonant as a bell—"I really mustn't waste any more time in idle chatter."

Virginia said in a level voice: "What have you done to Edgar Gray? He's a thing, not a human being."

The woman seemed not to hear. She was hesitating. At last, cryptically: "I must be sure you know enough. Have you ever heard of Dorial Cranston?"

There must have been a look in Virginia's face, for the woman said: "Ah, I see you've got that far. Thank you very much. You could have been very dangerous."

She broke off. She stood up. She said in an oddly drab voice: "That's really all I need to know. It is silly to give information to people who are about to die."

She was at the bed before Virginia could grasp the deadly intent behind the words. The knife, which Virginia had almost forgotten, flashed up in the woman's hand, then down at Virginia's left breast.

There was a pain like fire, a tearing sensation at her flesh. She had time to see the knife hilt protruding from just above her heart.

Blackness came, blotting out the unbearable agony.

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Professor Norman Mention was whistling happily under his breath as he entered the apartment. The hands of the hall clock were poised just over the seven. By the time he had deposited his hat, coat and cane in the hall closet, and glanced into the empty living room and kitchen, the minute hand had moved in stately fashion to five after seven.

He noticed, while hanging up his coat, that Virginia's current coat and hat and things were all there.

Still whistling, but more softly now, he walked over to the door of her room, and knocked.

No sound came from inside. Rather hastily, he retreated to the living room, and took up the copy of the *Evening Herald* that he had bought on his way home.

He was a highly trained reader, with a capacity of just under twelve hundred words a minute, but the effect of the enormous speed was partially canceled by the fact that he read everything but the society columns.

It was half past eight before he folded the paper.

He sat, frowning. He thought irritably: If Virginia had been sleeping since that morning, then she ought to be roused. And besides it was time she satisfied his curiosity as to the results of her vigil before the Futurian Science Laboratories the night before.

He knocked at the bedroom door, and, when there was no answer, opened it, and went inside.

The room was empty.

Professor Mention was not nonplussed. He stared ruefully at the unmade bed, and then shook his head, and smiled. After twelve years of being married to Virginia, he was well aware of the intricate maneuverings of women newspaper reporters.

It was not like Virginia to leave her room untidy, but it had happened at least twice before, and each time he had done what he did now: He made the bed, ran the carpet sweeper over the rug and mopped the floor.

When he was making the bed, he noticed a bloodstain on the sheet.

"Darn it," Professor Mention muttered irritably, "Virginia oughtn't to go out when her nose is bleeding, and without her coat, too."

He went finally back to the living room, and tuned in a comedy team, whose popular appeal he had for some weeks vainly tried to analyze.

The failure was repeated this night. He laughed hollowly once. When the ordeal was over, he clicked off the radio, and began to whistle softly under his breath.

After a while his watch said that it was eleven. Perhaps, if he phoned the *Herald* office— No, that wouldn't do. She was supposed to be sick.

He picked up a detective novel he had been intending to read for a month. At twelve o'clock he finished it, and looked at his watch.

He had felt the worry creeping up on him for some time. It tingled

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in the back of his mind all the while that he was reading the story. The ending, the act of closing the book, was like a cue.

Professor Mention stood up. He swore aloud. He told himself he was very angry with Virginia. She oughtn't to go off like that, and then not phone him.

He decided to go to bed. He woke up with a start. The dials of his watch showed eight o'clock, and the sun was peering through the window. Unnerved, he climbed from under the cosy quilts, and went into Virginia's room.

It was unchanged.

The important thing, Professor Mention told himself precisely, was to be logical. Suppose he did go to the police—after, of course, duly verifying that she was not at the office or at a few other places he could think of.

The police would ask questions. Description? Well, she was strikingly good-looking, five feet six inches tall, a sort of a redhead, though not exactly. There was an odd glint in her hair that—

Mention stopped that thought with a conscious effort. This was no time for romantic touches. "Redhead," he said aloud, firmly, "and she was wearing—"

He paused grimly. At this point at least, scientific accuracy was possible.

Resolutely he headed for her clothes closet. For ten minutes he fumbled with increasing gloom among some four dozen dresses, striving to picture which one was missing. The amazing thing was the number of dresses that he couldn't remember ever having seen before.

At the end of ten minutes, he knew himself defeated. He turned back into the bedroom—just as the hazy figure of a man stepped through the wall of the room.

He stood there for a moment, like a motion picture image focused on a cloud. The insubstantial form of him began to thicken. It became a man in evening clothes, a man with arrogant, sardonic eyes, who bowed coolly, and said:

"Don't go to the police. Don't do anything foolish. Perform your normal duties, and make reasonable excuses for your wife's absence. After that, wait. Just wait."

He turned. His body changed, became transparent. He stepped into the wall. And was gone.

There seemed nothing else to do. There seemed nothing TO do. Yet during the war he had learned the habit of decision.

Mention hesitated. Then slowly he went into his room, and removed the Luger automatic from the back of the drawer where he had kept it for years. It was a war trophy; and because he had won *the* medal it required no license.

He stood fingering it with a gathering skepticism. But finally, conscious of its symbolic importance to his morale, he put it into his coat pocket, and started out into the morning.

He was halfway to the university before it struck him that it was

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Saturday. Mention stopped short in the street, laughed harshly. To think that he had imagined he was taking it calmly.

He stood undecided, grim, thinking with a sudden, new dismay: a man who could walk through solid walls! What had Virginia run across?

His brain sagged before the implications. He felt strangely boneless, and dry inside, as if his body was all shriveled up by an intense inner heat. His fingers, when he raised them to his burning forehead, were moistless, almost abrasive.

He looked at them, startled. Then hurried into a corner drugstore.

"Give me an injection of blood plasma," he said. "I've just narrowly escaped being run over, and I feel dizzy."

It was only partly a lie. There was no question but that he was suffering from shock, and in no mild form either.

"That'll be one dollar," said the druggist a minute later.

Mention paid it gratefully, and strode out. His brain was working again; and his body had lost the drab sense of approaching unconsciousness. What he needed now above everything else was to appraise his situation.

He thought drably: The facts were: Futurian Science Laboratories—Edgar Gray—Dr. Dorial Cranston—a strange cold-faced man who walked through walls.

He stopped there. Once more he felt himself change color. He whispered huskily:

"It's impossible. I must have dreamed it. The human body is a structure evolved from a more primitive type. Therefore, unless—"

Higden's thesis! Only if man had once been innately capable of passing through substance, could outside energy help him do it now. Higden's thesis that present day man was a degenerate from a higher form must be correct.

Mention laughed curtly. He lashed at himself. "Am I having an academic argument with myself when Virginia is—"

His mind faltered. He felt the strain coming back. He saw another drugstore sign ahead. He went in and bought his second and last plasma injection.

Afterwards, physically buoyed but mentally depressed, he seated himself in one of the booths. An hour later, the reality was still the same:

He was a badly frightened man. And since the fear was not for himself, there was nothing he could do about it but what the stranger had suggested:

Wait!

SUNDAY: At 11 a. m., he went down town and peered through the plate glass window of the Futurian Science Laboratories. Edgar was there, a long skinny monstrosity, absorbed in a magazine.

After ten minutes, Edgar hadn't moved except to turn over pages. Mention went back to the apartment.

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MONDAY: He had one period without a class. There were three other professors in the recreation room. Mention turned the subject to the Futurian Science Laboratories.

Troubridge, physics professor, jumped at the use of the name, then laughed with the others.

Cassidy, assistant professor of English, said: "It sounds straight out of Tommy Rocket, the new comic sensation."

The third man changed the subject.

TUESDAY: He had no free periods. During the noon hour he went into the library, and asked for books by and about Dr. Dorial Cranston.

There were two by the doctor, and one about him by a Dr. Thomas Torrance. The first published of Cranston's two volumes was entitled "Physical Affinity Of The Human Race." Astonishingly, it was a tract on pacifism, a ringing condemnation of international slaughter, an hysterical document against war, in which the worthy doctor enlarged emotionally upon the theme that men were brothers under the skin. He advocated the extension of the handshake as a symbol of friendship, urged the adoption of promiscuous kissing among men and women alike, and spoke highly of the Eskimo custom of rubbing noses.

"Alien peoples," he wrote, "are electrically charged against each other, and only sustained physical contact will resolve the difference in their potential. A white co-ed, for instance, who allows herself to be kissed by a Chinese student will find that the hundredth kiss is far from repulsive. In the interval the man has become for her a human being, in some fashion which she cannot analyze. The next step, marriage, comes into her thoughts; and what began as a desire for exotic thrills has, through contact, attained a more honorable status. We see these marriages taking place all around us, and, unless we have ourselves established similar contacts, we cannot begin to comprehend how they ever happened."

Basically, stripped of its pacifistic ranting, that was the book. The lunch hour was over when Mention finished his perusal. He took the other two out, resolved to read them that night at home.

The second Cranston book was a repetition, in even more violent and dogmatic language, of the first. The man was obviously a bug on his subject; and it required a real effort for Mention to read the second volume to the end.

He picked up the Torrance biography of Cranston, flipped it open at chapter one, and read:

Dr. Dorial Cranston, pacifist, neurologist extraordinary, was born in Louisville, Kentucky, in—

Mention closed the book wearily. He was willing to concede that physical contact would do wonders for human relations. But it was already clear that the reading of

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old books about Cranston had no connection with the present reality.

WEDNESDAY. He had no new thoughts.

THURSDAY: Professor Troubridge fell into step beside Mention, as the latter started home.

"Norman," he said, "about your reference the other day to Futurian Science Laboratories: If they've approached you, don't hesitate. They can do what they claim."

For a moment, the words sounded as if they had been created at random by a mechanical word machine. But there was meaning finally. Meaning so important that Mention fought doggedly to prevent himself from blathering questions that would reveal his ignorance. He gulped, paused disastrously, and then was saved, as Troubridge went on:

"Three years ago, my physician, Dr. Hoxwell, told me that my heart wouldn't last six months. I went to the Mayo Clinic. They confirmed the diagnosis. It was a month after that, when I was already despairing, that I was approached by the Futurian people, and informed that I could be furnished with a new heart for ten thousand dollars. They *showed* me a heart in a glass case, beating. It was a living heart, Norman, and they said it made no difference what organ I needed at any time, they could supply it, provided I had the money."

Mention said: "I thought organic transplantations were impossible because—"

He stopped. Realization came that that wasn't really the thought in his mind. There was something else, a picture, a question that roared through his brain with the clamor of a tidal wave. As from a great distance, he heard Troubridge say:

"They can do it because they've discovered a new principle in organic electricity."

The thought that had come to Mention dominated the whole universe of his mind now. In a dead voice, he uttered the terrible words:

"Where do they get their *live* replacement organs?"

"Eh!" said Troubridge. His eyes widened. A stunned expression crept over his face as he whispered: "I never thought of that."

By the time Mention reached the empty apartment, he didn't want to think of it either.

There came purpose.

He paced the living room of the apartment that night in a fury at himself for having waited so long. And yet the problem was still: what should he do, what *could* he do that would be effective?

Go to the police?

He felt immensely reluctant. Because there was still a chance. They wouldn't have told him NOT to go to the authorities merely to keep him quiet for a week—if at the end of that time he went anyway.

He could mail a letter to his bank

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to put into his safety deposit box, which would be opened if something happened to him. . . . Yes, he would do that.

He wrote the letter, then sat at his desk striving to think. After a long period during which nothing would come, he began heavily to write down a list of possibilities, item by item:

Virginia accidentally runs across Futurian Labs. She disappears.

I am warned by a man who walks through walls. I discover that:

(1) Dr. Dorial Cranston, founder of Futurian, is a fanatic Pacifist as well as a neurologist.

(2) That Futurian sells human organs on a mass scale to rich men. (This is probably their purely commercial enterprise, their source of income.)

(3) The ability to walk through walls is obviously a means of power, and they are not sharing that with anyone. Yet they seem unworried by the fact that I know about it.

(4) Cridley, science editor of the *Herald*, told Virginia that several attempts to investigate Futurian were stifled in embryo stage, proof that they have influence in high places.

(5) There is absolutely no reason why they should treat Virginia any differently than they do the other—sources—of their live organs.

Mention wrote the last sentence grimly, then stared down at the list, dissatisfied. It seemed to offer no lead that he could follow with even the vaguest possibility that he would find Virginia.

After a moment, he wrote slowly:

If I went to the police, and they arrested Dr. Cranston and Edgar Gray, Cranston would walk out through the walls of the prison, and Edgar would—

Mention lifted his pen, and stared with a sudden heady surmise at what he had written: Edgar! If it was true that there were Futurian shops in all the large cities, then there were hundreds of Edgars all over the world acting as receptionists. But—Edgar!

Virginia had disappeared after a night of investigating Edgar.

What had she discovered?

Excitement touched his mind, then flared through his body. He looked at the mantel clock. It showed one minute to ten. If he hurried, he could get downtown just about the time that Virginia had phoned the night she followed Edgar.

He might be trailed of course, as she must have been.

Edgar was still there. Mention parked his car a little way along the street, but at a point from which he could see Edgar plainly, where he sat under his spotlight.

Edgar was reading a magazine. At 11:30, Edgar rose, put on his hat, switched out the light, and came out of the door. He locked the door behind him.

He did not look around him, but headed straight for the restaurant where Mention had often eaten with Virginia. Mention climbed out of the car, and walked over to the restaurant window.

Edgar was at the counter, wolfing a piece of pie and a cup of coffee. He put some money on the counter; and Mention had time only to turn his back, as Edgar emerged from the door.

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Edgar hurried off down the street. After five minutes he turned into the dimly lighted foyer of an all-night theater. Mention debouched from his car again, bought his ticket a little breathlessly—and a minute after that watched Edgar sink into a seat well down in the front of the theater. He edged into the third row behind Edgar.

At three o'clock Edgar was still in the show, goggling bright-eyed at the screen. It was shortly after that that Mention fell asleep.

He wakened with a start. His watch said 6:45. Edgar was hunched down in his seat, his legs over the back of the seat ahead. But he wasn't sleeping.

At 7:40, he got up abruptly, and hurried out of the theater. Straight for the restaurant he headed, with Mention following a hundred feet behind. It took four minutes for Edgar's meal to be served, three for him to eat it. At the counter the girl handed him two of their made-up box lunches; and then he was outside.

He paused in a drugstore to purchase four magazines.

At one minute to eight he unlocked the door of the Futurian Science Laboratories, and settled himself in the chair behind the counter. He picked up one of the

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magazines and began to read.

Apparently, his long day was about to repeat itself.

Now what?

Back in the apartment, Mention wakened himself with a cold shower, hurried through a breakfast of toast and coffee, and then set out for the university. His first class was not until twenty to ten; and so he had a reasonable amount of time to ponder his findings.

Actually, what had he discovered? Nothing except another facet of the neurological research of Dr. Cranston. The man was undoubtedly a genius. Perhaps *he* had passed over the books by and about Cranston too hastily.

There was nothing to do about that until night. Then he took down from the shelf, where he had put it unread, the biography of Dr. Dorial Cranston by Thomas Torrance, Ph.D.

As he opened the volume, he saw that there was a picture in the frontispiece, a photograph of a man standing on the terrace of a swanky house.

Mention jumped as he saw the picture, then stared and stared at the cold, sardonic face and powerful body. The caption underneath read:

The author, Dr. Thomas Torrance at his palatial home in New Dellafield, Massachusetts.

There was no mistaking the identity. Torrance was the man who had stepped through a solid wall, and warned him not to call the authorities.

He couldn't think. The sleep he had missed the night before, the sheer nervous exhaustion of the past week, took their toll of his brain now, when he needed strength to examine the potentialities of his great discovery.

His last thought before he finally allowed the sleep to engulf him was: Whatever had happened to Virginia had happened during her sleep that day. Perhaps he too—

He woke up annoyed that he was safe, and then, slowly, he grew aware of a purpose. His watch said 11:15. He stood up and headed straight for the phone.

Considering that his call was from California, it went through swiftly. After fifteen minutes the phone rang.

"Your party, sir," said the operator.

Mention drew a deep breath; then tensely: "Hello!" he said.

There was the sound of the operator hanging up, a pause, and then a familiar voice said quietly:

"What's on your mind, professor?"

Mention gulped. The words were all wrong; and the confident implications of the quiet tone in which they were uttered, stunned him. Incredibly, he felt ridiculous, as he said:

"Torrance, unless my wife is returned at once, I shall take action."

There was a little silence, then a half chuckle:

"I'm curious," said the voice,

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"just what kind of action you have in mind."

The arrogance was almost palpable now. Mention was conscious of a distinct emptiness inside him. He fought off the feeling. He said thickly:

"First of all, I shall go to the newspapers."

"Nope, won't do!" said Torrance in an oddly judicial tone. "We've had every newspaper owner in the country in our organic wards. And, just in case you have other ideas, that also goes for state governors, lieutenant governors, states attorneys, cabinet ministers and a few others."

"That must be a lie," said Mention. He felt suddenly colder, more sure of himself. "It's against the law of averages that every one of those men could have had something wrong with him."

Torrance's laughter peeled over the receiver.

"I'm afraid," he said, "we'd be waiting yet if we had depended on Nature." His voice tightened. "Our main base of operations, Mention, is on North America, so we couldn't take chances with men like that. We went after them, and they're now, I assure you, solidly in our clutches."

He ground on, without pause:

"I won't explain the how of that, professor. Just take my word for it. You could of course go to the local police. We never bother with small fry until they bother us. Then we neutralize them. I hope I have made everything clear. And now, if you don't mind, I shall—"

Rage came so abruptly to Mention that he had no time to fight it.

"Torrance," he shouted. "What have you done with my wife?"

The reply was cool: "My dear fellow, this will surprise you. But *we* haven't got your wife. Good-by."

There was a distinct click.

Doggedly, Mention put a call through to the small city in New Jersey that was given in Cranston's books as the residence of the author.

"Hello," he said, when the connection was finally made. "Is that you Dr. Cranston?"

There was a chuckle over the receiver. "My, my," said the voice of Thomas Torrance, "but you are persistent."

Mention replaced the phone on its cradle without another word. Just how a call to New Jersey could be switched to Massachusetts was not clear. But he accepted the fact of what he had heard.

He was turning blankly towards the living room—when Virginia, a hazy figure, stepped through the wall of the hallway.

She was wearing pajamas; and the insubstantial form of her—thickened—before his eyes. For a long moment she stood there staring at him with anguished eyes.

She began to cry. Tears streamed down her cheeks. Her face grew wet. She ran towards him. Her arms clutched him with the strength of panic-stricken terror.

"Oh, darling, darling," she sobbed. "They've killed me. *They've killed me!*"

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She moaned and cried in those minutes before full awakening. The horror of what she had last seen—the knife in her heart—was strong in her mind, like acid burning.

She wakened with a start.

She was lying in a large, curious room. It took a long moment to grasp that she was stretched out on a table; and a full minute must have passed before she grasped dazedly that the knife was no longer protruding from just below her breast.

With a shock like fire, it struck her that there was no pain, and that she was alive.

Alive! She sat up shakily. And instantly sagged back at the sharp splinter of pain that jabbed at her left breast.

The pain subsided. But the fact that it had come at all left her weak with fear. She lay, not daring to move.

She grew more aware of her surroundings.

The room she was in was about a hundred feet square. It was almost completely filled with little glass cases. The cases lined the walls, and stood on the floors, with only narrow aisles between them; and each case was divided into compartments about two feet square.

By turning her head, Virginia could see plainly the inside of the compartments against the wall to her right and left.

Each one contained what looked like a human heart, suspended from a small machine in the ceiling of the compartment.

She stared at them blankly; and she was on the point of turning away when the realization struck with a terrible force: The hearts were beating.

Strongly, steadily, they expanded and contracted. There was no pause in that quiet movement. The sustained quality of it calmed her, quieted her overstrained nerves. After five minutes, consciousness came that she ought to examine her personal situation again.

Cautiously, almost without fear this time, she lifted her head. For the first time, now, she saw what she had missed before:

A square of cloth had been cut out of her silk pajamas. There was a clean, white bandage carefully taped where the knife had penetrated.

Curiously, it was the pure whiteness of the bandage that braced her. It suggested skillful medical attention. It suggested that she was being looked after. The death that had so violently threatened her was frustrated.

She began to think of herself as being in the private surgery of some neighborhood doctor. She must have been rushed to him for emergency attention.

She was alive, but it seemed odd that no one was attending her. Surely, she wasn't going to be left here on this table.

Just like that, anger came. And because fear was still a wavering, dark curtain in the back of her mind, the anger was unnaturally violent and unreasonable.

Anger faded before the passing of the minutes. If she had been in a bed, she would have lain quietly,

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and awaited events. But it was impossible to remain on this flat, hard table.

She had allowed her head to sink back to the surface; now she raised it again. Carefully, putting most of her weight on her right arm, she raised herself to a sitting position.

Nothing happened. No pain, not a twinge of the anguish that had struck at her a little while before. Evidently, the important thing was not to move too rapidly.

She sat for a minute on the edge of the table, her legs dangling, looking around from her new vantage point at the fantastic total of human hearts all around her.

She began to be afraid. It was unreal, that row on row of quietly beating hearts, each in its compartment, each functioning with a steady *lifeness*.

Most disturbing of all was the complete absence of human beings. Except for its unnatural furniture, the room seemed utterly empty; it unnerved her.

Trembling, Virginia lowered herself to the floor. She stood very still, letting the strength flow back into her body.

It was pleasantly surprising to realize that there *was* strength.

She walked along an aisle, glancing only fleetingly at the double line of hearts. The number of them made her uneasy again. There was a door at the far end of the room. One of the hinges, and the lock, were badly smashed. It opened easily however onto a stairway that led upwards to another door.

She climbed with a sense of

GOING · ·
GOING · · ·
GONE!

—on an adventure that led Doc Savage and the gang from a Manhattan auction room to the rim of the Grand Canyon.

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AT ALL NEWSSTANDS

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urgency, a conviction that she must get away from those phalanxes of soundlessly beating hearts.

The second door was metal. But its lock too had been roughly handled, though there was a key in the shattered keyhole.

She opened the door, eager now; and stepped out onto a jungle pathway. A brilliant sun was shining down on a hilltop clearing a few feet away. She climbed towards it, reached it, and stood briefly paralyzed by what she saw.

Virginia Mention paused in her recount of what had happened. Her husband had laid her down on the bed; and from that prostrate position she looked up at him. He was staring down at her with a grim tenderness.

"But you're not dead. You're here with me, alive and safe.

She said hopelessly: "You don't understand, sweetheart. You . . . don't . . . understand."

Professor Mention replied quietly: "Go on, my dear. What did you see that startled you?"

She was on an island, an atoll green with jungle, and surrounded by a blue ocean that extended on every side as far as the eye could see.

The sun, though still high in the heavens, was well past midday. The heat was blasting; it made her feel ill.

Dizzy, she turned to look at the door through which she had come. She expected to see a building, but there wasn't one.

Undergrowth spread in a thick tangle all around where the building should have been. Even the open door was half hidden by lichens that intertwined cunningly all over the exposed metal face of the door.

There was a strong odor of dying vegetation.

To Virginia, standing there under that lonely brilliant sky, came an unreasoning fear that the door would close, and shut her forever out in this empty world.

She started down towards the door. She had taken only three steps when a thin, screaming sound touched her eardrums. The sound came from the remote sky to her right. It was faint and faraway at first, but grew louder and louder.

After a moment of worried puzzlement, she recognized with relief the origin of the sound: A jet-propelled plane.

It came into sight, a black point in the blue heavens. It took on size. It was a twenty-jet machine about two hundred feet long, wingless except for the upward bending wing struts supporting its vertical jet fuselages.

It flashed past, unaware of her frantically waving arm, a passenger express plane bound from beyond the eastern horizon towards the setting sun.

She watched it till it disappeared into the sun-fire, hope dying gradually. The return of silence startled her. Shocked, and enormously depressed, she remembered again her fear of the door closing upon her.

She entered it hastily, closing it behind her, but not locking it. Be-

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fore, she hadn't noticed how cool and comfortable the "weather" was in the great room, nor had she been aware of the indirect lighting. Now, her attention fastened eagerly on the evidences of mechanization. There must, she thought anxiously, be a basement, perhaps other underground floors. The electric power must have a source.

For a timeless period she searched for a second door, but succeeded only in tiring herself. She lay down on a couch which she discovered at one end of the room; and she was resting there when her darting gaze brought her awareness for the first time that each transparent compartment of the showcases had a little placard attached to it.

A name was printed on the first one she examined; it read:

Morrison, John Laurance
257 Carrigut Street,
New York City.

The second one also had name, and nothing else. Virginia walked slowly along the line of compartments. She was at the N's before it struck her that the compartments were ticketed in alphabetical order.

Her mind made a fantastic jump; and she rushed over to the P's. She found the name she wanted instantly; and, having discovered it, stared at it blankly:

Patterson, Mrs. Philip
(Cecilia Dorothy)
Suite 2, Mayfair Apts.,
Crest City, California.

The blankness ended abruptly. With a gasp, she hurried over to the Grays. But Edgar wasn't there. The only person with anything like his name was:

Grey, Percival Winfield,
3 Huntington Court,
West Tuttenham,
London, England.

Briefly calm, Virginia stood watching Percival's heart as it beat on quietly. She was thinking:

But of course! Edgar was not one of them. He was a slave, held somehow in a thrall that included an utter inability to sleep.

After a little there seemed nothing to think about that. But another thought came, a thought so tremendous that her mind rejected it three times as she ran back towards the M section. But each time it came back stronger and more terrible.

She found the compartment she sought. The heart in it was slightly different from the others. It was beating steadily, but it had a small, neat bandage over a portion of the flesh wall facing her. The placard on the glass was equally unmistakable:

Mention, Mrs. Norman (Virginia) . . .

Virginia Mention stared at the thing with avid eyes, like a bird fascinated by a monstrous reptile. A sound came from behind her, but she heard it only vaguely. It came again, and this time it snatched at her attention.

It was the sound of a man clearing his throat. A slow, quiet voice said:

"Dr. Dorial Cranston at your service, madam."

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Virginia had no memory of turning. Nor did she so much as think of the fact that she was in pajamas in front of a strange man.

The man standing before her was old; and he wasn't at all what she had expected. Just what she *had* expected she couldn't have said, but not a gentle face. Not a sad-looking, old, old man with tired blue eyes, who bowed gracefully, and spoke again, in the same oddly matter-of-fact way:

"The problem of keeping organs alive outside of the body was solved in various countries before, during and after the second great war. But the best work was done in Russia. I like particularly the various mechanical addenda, such as the autojector, which they brought to a high degree of perfection. Of course, in the preservation of the organs, I merely used the discoveries of the Russians and of the scientists of other nations. I'm a nerve man myself. I—"

It was at that point that Virginia found her voice. She had been standing staring glassily, but with her courage coming back instant by instant, her eyes brightening before the mildness, the obvious harmlessness of this old man. Yet, in spite of terrible relief, there was a tenseness in her, a need to *know,* unlike anything she had ever experienced in her life.

In a piercing voice, she cried: "But if this is my heart"—she jerked her arm with automatic stiffness towards the living flesh behind the glass—"what's inside me now? *What?*"

The harmless old man looked suddenly cool and unfriendly. He said in a frigid voice:

"You were stabbed to death, weren't you? Yet now you're here talking to me. Don't worry about what's inside you. I took out a lot more than just your heart. Don't bother searching for more operation cuts. I don't work that way. Come over here."

Without waiting to see if she would follow, he turned and walked with the sedate bent-knees movement of age towards the "back" of the room. He touched something embedded in a narrow stretch of bare wall. A door swung noiselessly open, revealing a set of stairs leading downwards.

The room below was as large as the one above; and it too was completely filled with glass cases. The contents of the compartments were various: hearts, lungs, liverlike organs; there was even a pancreas and a few pairs of kidneys.

All of the organs seemed alive. The lungs were definitely so. They expanded and contracted gently but with unmistakable strength and sureness.

The old man paused before a compartment containing a pair of lungs. He motioned wordlessly towards the placard attached to it. Virginia braced herself, as she stepped forward. The bracing helped. It was her own name.

Slowly she faced him. Her mind was clearer, fear a fading force. The reality was that she was alive. Beside that fact, all this had no

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meaning. She laughed harshly.

"Please stop playing games. What do you want, all of you?"

She had thought herself calm, but there was enough hysteria in her voice to shock her. That woman, she thought, that terrible woman had scared her. She found her voice again:

"Dr. Cranston," she said earnestly, "you look honest. What is all this? What has happened?"

The old man shrugged. "I'm afraid I don't dare tell you anything but that these are your lungs, and the heart upstairs is your heart. An organ removed in its entirety does not involve serious damage to the nervous system of the body except at one or two key points, and those are easy to fix."

He looked at her. "I suppose you've been outside. I was prevented from coming back here as soon as I intended, so you've had time. I'm sorry about that. I've never been able to fix the locks on those doors. They were smashed by a man whom I saved as I have you and who—" He paused. "Never mind.

"About the organs," he said, "After they killed you, I could do nothing but take them out. Your brain"—he turned to a nearby case—"is here. Mrs. Patterson was very thorough. After she had stabbed you to death, she used a long needle to pierce your brain through your ear, and she also pricked at your lungs. Her intention was to make certain that you would not be brought back to life in any normal fashion. She, and the others, have an idea that if I am forced to make replicas of themselves that I automatically create a recruit for them. So far"—he smiled grimly—"they have proved right."

He frowned, then reached briskly into his pocket, and produced a necklace with an intricate pendant suspended from it. He held it out.

"Here is your radio device. Whenever you want power, touch this little lever, and say into the pendant: 'Press button 243.' That's your number. Two four three. Don't forget it. I'll call it for you this time, so that you can get home."

He fastened the pendant around her neck, touched a tiny lever, and said:

"Press button 243."

There was a pause; and then—she began to burn inside. It was so sharp, such a flame of agony that she cried out. Her breath came in quick gasps. She twisted. She started to run. But there was nowhere to run. The pain went with her, like a moving directed fire.

The conviction came that she was really dead; and that all that had gone before was a dream, a flashing kaleidoscope of unreality born out of the hideous pain of dying. Through a blur, Dr. Cranston's voice came to her:

" . . . Very painful the first few times. But remember that your brain controls the power. When you *think* yourself insubstantial, that is how you will be. The moment you let go of the thought, you return automatically to a state of solidity. The power to do that wears off after a few hours, and requires recharging.

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I shall come with you as far as the outer walls of your apartment."

Virginia was in the apartment, and for long minutes babbling away to her husband, before realization finally came that she was not dead. That actually her situation was worse than that.

She must have been unconscious for a week, to have memory of only a few hours of waking.

By noon they were no further than that. She couldn't stop talking. Twice, Mention persuaded her into bed, but each time when he went into the kitchen to mix her a drug, she was out from under the quilts and following him.

After the second time, the knowledge penetrated that he had a mentally sick woman on his hands. Above everything else, she needed rest, time to calm down.

He managed finally to give her the protein sleep drug, cadorin. But it was not until he lay down beside her that her voice grew drowsy; and she fell into a restless sleep.

He had time to wonder what he ought to do, now that she was back. He was still utterly divided two hours later, when she wakened, tense and terrified.

"That woman," she began thickly. "She put a needle through my ear into my brain, and she pricked my lungs. She—"

"Many people have pierced eardrums," Mention suggested. "The important thing is she didn't disfigure you."

The phrase had proved briefly magical a half dozen times before. It proved so now. The funny, mad look went out of her eyes. She lay quiet for a long time. So long that Professor Mention got worried.

He glanced at her cautiously. Her eyes were open, but staring, and narrowed with thought. For a minute, unobtrusively, he watched her. Then, slowly, he said:

"Apparently, what we have here is a gang, remorseless, murderous, infinitely evil. It was founded as the result of a neurological discovery of Dr. Dorial Cranston, but he himself is not one of the gang. *Its* political and material power seems indestructible. It's too big; like a gigantic octopus it sprawls over the earth. But Cranston goes around trying within the pitiful limits of an old man's strength to undo the damage done by the monsters he has created."

"Norman!"

The tone of her voice indicated to Mention that she had not heard a word he had said.

He spoke softly: "Yes, dear?"

"Norman, Dr. Cranston won't live much longer. Do you realize that?"

He knew there must be a deeper meaning behind her words than just the fact. After a moment he thought he had it. He said:

"You mean, then there will be no check on those devils."

Once again, she seemed oblivious to his words. Her tone was more urgent, intent:

"Norman, if he's the only one who knows where that island is, then what will happen to my heart, and the hearts and organs of those others, after he dies. Surely, they

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won't go on beating, *living*, without attention."

It was odd, but for a moment the words meant nothing to Mention, but that here was one more fear to soothe out of her tortured mind. He actually formed the calming words on his lips; and then he stopped himself.

He lay very still, mentally transfixed. "That's it!" he thought. "That's their fear. They must be desperate. They'll stop at nothing."

His mind leaped out over the possibilities. By evening he had still to come to a decision. It was amazingly hard to know what to do, what could be done, against such a vast organization.

The days strode by while he stood moveless in his mental valley of indecision. Each day Mention told himself:

"Surely, today something will happen. They'll do something, show in some way why they did all this to us."

Virginia returned to work. A whole month passed. It was a week after that that Mention walked into the apartment one afternoon—just as Virginia stepped through the wall and materialized in the hallway.

She was radiant. She glowed. There were times in the past when he had seen her alive and excited. But never like this. Her body was vibrant; it seemed to cast off an aura inhuman in its power. Almost literally, her face glowed.

Mention stared at her; and slowly her richly tinted cheeks lost their natural color. It was their day for eating in. Without a word Virginia turned, and hurried into the kitchen.

Two hours later, when the radiance of her had faded to normal intensity, Mention looked up from the newspaper, and said quietly:

"Virginia."

She jumped; then:

"Yes?"

"How often have you done that?"

She was visibly agitated. It struck Mention with a shock that, in some curious way, she had hoped he wouldn't refer to what had happened. Her lips twitched. Her eyes wouldn't meet his. She said finally in a low voice:

"That was the first time."

She was not, he thought, used to lying. So that the lie was as transparent as a child's. He felt sick; then in automatic defense of her, told himself that she had never recovered from her experience.

He said gently: "Why did you do it?"

She seemed relieved that he had accepted her statement. She began eagerly:

"I wanted to see how it worked, partly because being able to do it might prove a defense against them; and I couldn't remember what it had been like the first time. I was too excited then, and besides it hurt terribly."

"And this time?" Steadily.

"It didn't hurt. I felt alive, warm, wonderful. After a while I wished myself insubstantial, and it was so; then I stepped through the wall, simultaneously wishing myself in the alley behind the *Herald* office—and there I was. I felt no sensa-

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tion. The movement through space was instantaneous."

Her eyes were wide as they gazed into his. Briefly, all fear was gone out of them. She breathed:

"Norman, its miraculous, godlike. It's—"

"Why not try," Mention said, "to wish yourself on the island? I'd like to have a talk with Dr. Cranston."

Virginia shook her head vigorously. "It's impossible. I don't mean I tried to go there. But I made several attempts to go to places I'd never been; and nothing happened. You have to know the direction; and you have to be able to visualize the place. You have to *know* where it is you're going."

Mention nodded slowly. "I see," he said.

He let the subject drop, but he thought wearily: "This is what they're waiting for: To let the reality of her situation sink into her. To allow her time to grasp that she is in the same box as they are."

But why? What did they want of her? They had started off by killing her because she had made some minor discoveries about them. Then, when Cranston interfered with the finality of their murder, they had warned Virginia's husband not to go to the police. They wanted something; and now that they had gotten Virginia to experimenting with the power they had given her, it shouldn't take long before they showed their hand.

He glanced up at Virginia. She was sitting, gazing into space, her eyes half closed. Mention felt a sudden, enormous unease.

It was ten o'clock that night when the doorbell rang jarringly. Mention glanced at Virginia, and then stood up.

"We won't be getting friendly visitors at this hour," he said. "Better call Edgar, and tell him to press button 243. No use taking chances."

He waited until she had spoken into the wrist radio, then slipped the Luger into his pocket, and went to the door. It was a messenger boy with a letter. The letter read:

Wednesday the 23rd.

Will Professor and Mrs. Mention come Friday evening at seven to a dinner party in the main dining room at the Grand York Hotel? Give your name to the maitre d'hotel.

Cecilia Patterson.

There was one thought that dominated all others in Mention's mind, as he read the letter: Action was beginning. If ever he intended to do something not of *their* choosing, the time had come.

He spent the night, thinking, straining, for a clue. He was in the middle of a lecture the next morning when comprehension came as easily and quietly as life to a newborn puppy.

He stood very still, staring at the class, but seeing only a blur of faces.

"Why," he thought in a great wonder, "it's been there before our eyes ever since Virginia came back. What blind fools we've been not to realize."

Not until he was on his way home

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did he realize what *he* must do about it.

He left his bedroom window open.

He waited until the illuminated dials of his watch pointed at two. He dressed silently, shoes and all, then waited until a streetcar moaned past along a nearby street. He let the outside sound clothe any sounds he might make in moving to the window.

The drop from the second story window jarred his bones, but the softness of the earth in the flower garden below saved him from injury.

There was a twenty-four hour U-Drive-It garage three blocks away. Half an hour after leaving his room, Mention slipped into the theater seat beside Edgar Gray.

"All right, Edgar," he said quietly. "You're wanted. Come along."

"Glug goo?" said Edgar in a whispered fear.

"Come along!" hissed Mention threateningly. And flashed his Luger.

Edgar came. Mention drove out into the country, and parked finally in an open stretch of farmer's roadway, off the main highway.

He didn't switch off the motor, and he left the gear in medium, and kept his foot on the clutch—just in case. But he knew he was safe. Even they couldn't be everywhere.

The idea of using Edgar for his purpose seemed cleverer every minute that passed. There were two problems in connection with him: one was to get him to talk in an understandable fashion; the other was to see to it that Edgar told no one of this meeting and its results.

It was the first problem that proved difficult. But after half an hour it began to solve itself. Mention found that he was beginning to understand Edgar's gloppings. Behind all his incoherent glugs and glibbers, Edgar spoke English.

Mention expected little from the questioning phase of the interview; and that was exactly what he got.

The mind of Edgar was a misty region, but the darkness lacked depth. If a human brain could be compared to a book, then Edgar's was a magazine of the more lurid sort. But he was almost completely lacking in personal experiences.

An orphan from babyhood, he had spent the first fifteen years of his life within the walls and behind the fences of an institution. At fifteen, *they* had picked him up, and put him behind the enormous glass window of the Futurian Scientific Laboratories, and he had been there ever since.

"But," asked Mention, puzzled. "You have been treated, so that you don't need sleep. When was that done?"

"When they took out my heart," Edgar mumbled, "and my lungs and my brain and other things, they said I wouldn't need sleep anymore. They do that to people they want to control."

"Yet," Mention thought precisely, "Virginia sleeps normally. There are variations and variations to this business."

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Edgar finished simply: "I was scared at first but"—his voice tightened with hate—"the woman whipped me a couple of times, and then I didn't dare not do as they wanted."

It was the suppressed fury in Edgar's voice whenever he talked of "the woman" that solved the second problem.

"Listen, Edgar," Mention said earnestly: "I'm on your side against that woman. When I get through with her, she'll never whip you again; and you'll have a chance to do all the things you've ever wanted to do."

That last was important. A youth who read as much escapist literature as Edgar must be absolutely maddened with the desire to go places and do things.

"Listen," said Mention, "here's what I want you to do. Tomorrow night at twelve o'clock, a jet plane leaves here for Los Angeles. At 1:30 a.m. a rocket ship leaves Los Angeles. I want you to be on that jet and make the connection with the rocket."

"Me on a rocket ship," gurgled Edgar ecstatically.

"You'll be back in time for work; so don't worry about that. Here's some money, and a notebook containing exact instructions as to what you are to do. I've even left spaces for the answers I want you to write down."

He handed over the notebook and the money, and watched Edgar slip the former into his breast pocket, the latter into a small billfold. Edgar's fingers shook with excitement.

Mention trembled too, but it was not excitement. He felt cold and hot by turns as he thought of Edgar having that notebook all day long. If *they* ever got hold of it—

Mention shivered, and drew his gun. He made his voice hard and cold.

"Edgar, take one last look at this. If you fail me in any way; if you don't do this job, and do it right, I'll use this gun on you. Understand!"

In the dim light of the dashboard, Edgar's eyes glowed with understanding.

"Glug goo!" gulped Edgar.

Mention taught at the university as usual the next day. It was during the noon hour that he put through his phone call.

"Tell her," He curtly informed the male servant who answered, "that it's Professor Mention."

A minute later, a woman's voice glowed on the phone. Mention said:

"Mrs. Patterson, I wish to change the hour of our dinner from seven to midnight. I believe the Grand York holds late dances every night, so there will be no difficulty about getting the service. The reason?"

Mention laughed curtly. "Do I have to give one? All I'll say is, my wife and I won't come unless you agree. You do! Very well."

He felt grimly pleased, as he hung up. It was risky; it would make them suspicious. But Edgar's movements would now be as free from watchful eyes as the precautions of one man could make them. There

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were only three dangers now:

First, that it didn't matter what he did. Second, that he was not really fooling them at all. Third—

Nitwit Edgar himself.

They were led to a table where four men, one of them Torrance, and five women, one of them blond Mrs. Patterson, were already seated. The men stood up. The women ceased their animated talking, and looked them over curiously.

Their faces shone with unmistakable extra life. All nine, men and women both, almost literally glittered with power. The table was the center of attraction. People kept glancing over from nearby tables, in fascinated awareness.

Mention felt drab and lifeless beside them, as he sank into one of the two empty chairs, but it was a physical feeling only. Mentally, he had never been more alive, more determined.

Convince Virginia, he thought, that she had nothing in common with these creatures. Gain information. And give Edgar time to get safely started on his long, swift trip. Those were his purposes.

The anxious hope came that Edgar had not been drained of strength to provide the glittering life that these people now paraded.

It was worrying. Picturing the possibilities made eating his fruit cocktail an effort. In the end he could not contain himself. It was Torrance who answered his carefully worded question:

"No, the Edgars in our power centers are not 'batteries'. They're transmitters. The word, negative, is the key. Every time somebody passes the great plate window behind which Edgar sits, there is a tiny flow from them to him, but he can't use it. Where Edgar's internal organs—and mine and your wife's—used to be, are now electronic impulsors largely made from tantalum. One difference is that Edgar is negative. Your wife and the others and myself are positive. Is that clear?"

It sounded like Yogi mouthings. But apparently he was going to be given information. He flashed his next question. Torrance answered promptly:

"There are two hundred forty-three of us including your wife. Of course," he went on, "we're only the executive central. We own immense property, and have tens of thousands of employees, including the people we have had watching you and your wife."

He laughed. But Mention was not amused. The personal words had come so unexpectedly that he swallowed hard. He forced his tensed nerves to relax. Only what he had done last night mattered, he told himself unsteadily. And because of his precautions no one, absolutely no one, had followed him. He was sure of that.

It was clear, though, that the man was playing with him. It startled him. It brought awareness of how tremendous was the power these people must believe themselves to possess.

He felt shocked into studying for

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the first time the faces around the table.

He had thought the four men were handsome, and the five women regular streamlined beauties. In a way that first impression was not wrong. Even now, examined intently, all nine, men and women alike, showed themselves to be well formed physically, a quality enhanced by the fact that they were marvelously well dressed and marvelously well groomed.

At that point the beauty ended like a road snapped off by the gap in a bombed-out bridge.

Those finely formed faces were chiseled masks of hardness. Merciless, inhuman hardness. Here was an innate cruelty that only Death personified could equal. Their eyes were slate-blue and slate-gray and slate-brown. Their lips were uniformly thin and compressed.

That was the underlayer. Superimposed, dominating, crowning each countenance was arrogance, supreme and terrible arrogance.

There was no question at all. They *did* believe in their power.

Mention ate his soup course, fighting for calm. He stole a glance at Virginia, but she was staring down at her plate. She had, he saw, taken very few spoonfuls.

He thought darkly, in surprise: Nobody was saying anything. The only words they had spoken so far had been in answer to his questions.

He saw that Torrance was smiling enigmatically.

Stronger grew Mention's convic-

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tion that he was being toyed with. And yet, up to now, he had lost nothing, had actually gained information.

That course couldn't be dangerous. He asked his next question. As before, it was Torrance who answered, and with the same promptness, the same apparent honesty:

"You're right, there wasn't much about Cranston's discovery in his books, mainly because he hadn't discovered very much when he wrote them. And my biography of him was written to kid him along at a time when we were building up our organization."

He paused. "Don't forget, in thinking of Cranston and his work, that he's a nut. For instance, it was not until he discovered that his idea of spreading good will by universal physical contacts was not going to be given a trial that he conceived the idea that artificially magnified nervous energy might do what he required—without contact.

"Never did a theory of a man fall on a smoother, rounder surface. That ball is rolling yet.

"Within the short space of one year, Dr. Cranston had found that an interflow of energy took place every time two or more human beings came near each other. It was a genuine transference of life force, but it needed magnification before it would have the same effect as physical contact. Accordingly, he engaged a first-rate electronic engineer—myself—to develop a tube and a circuit which not only magnified the organic energy, as he called it, but which could tune each individual's wave length at will.

"An improved version of that original circuit is now inside your wife keeping her—connected—to the hearts, lungs and brain in Dr. Cranston's secret laboratory."

He gazed earnestly at Mention. "Cranston has never explained to me why it is necessary for the organs to be outside the body, except to say that there must be a flow over distance. Yet at the same time there is no distance. The blood, the nervous energy, every breath of air we take is pumped, flows and is purified by the organs in those glass cases of his. If anything happens to those organs, we'll die."

Mention hadn't intended to speak. But this was what he had wanted to know. All his doubts had writhed around the one point of those human organs in Dr. Cranston's island laboratory.

And they were connected. They were. Nut, the old fanatic might be. But he had these Machiavellians in the palms of his two hands.

But why—the wonder was a savage force—why hadn't Cranston used his control, and destroyed the whole lustful crew?

That was the question that burst from Mention's lips. And Torrance, his eyes like gray-diamond drills, answered from between clenched teeth:

"Because he can't bring himself to kill. Because he's a bug on pacifism as no one ever has been. Think! His whole discovery, this tremendous discovery, is based upon his emotional desire to find a

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practical method of spreading good will.

"That emotionalism is our deadly danger. It makes it possible for him to fool himself. It's true he can't bring himself to kill us. But he's seventy-eight years old. Not old as ages go nowadays, yet well over the average life expectancy.

"He could, literally, die any day. He stubbornly refuses to recognize that possibility. He won't permit our doctors to examine him. In some queer way, he's convinced himself that if he dies, and we don't find our organs in time, then he won't really be responsible for our deaths.

"How did he get them in the first place? Man, who'd ever suspect that an old fool like that would be so cunning. He performed all the operations except his own. And somehow he must have become suspicious of us."

Torrance was utterly intent now, his gray gaze so concentrated that Mention had the impression of two dully blazing lights shining at his face.

"Mention, we must locate that laboratory. We must gain control of our vital organs.

"That is where your wife comes in."

Torrance paused.

There was no question but that he had come to his point.

You see, professor," he went on softly, "every time we discover that someone suitable to our purpose is investigating us, we wait until we think they know enough to take the shock of revival. It is amazing how little knowledge is required, and yet how important it is; dozens of people whom we simply picked up on the street went insane on us.

"Anyway, we kill the investigator at the right moment, then transport the dead body to Dr. Cranston's home.

"Here again, care is necessary. The old man tires quickly these days. And when he is tired his emotional mind convinces itself easily that there is nothing he can do.

"So we found it was useless to bring him too many bodies.

"Under normal circumstances, however, the poor old fool can't stand to see people dead when he knows he can do something for them. He is particularly partial to" —smilingly, Torrance bowed at Virginia—"to beautiful women. And, even though he is aware of our purpose in bringing the corpses to him, he has reached a state of mind where he doesn't care. He feels hopeless, defeated by our enormous organization.

"Accordingly, over a period of time, we have built up a picture of the surroundings of his hiding place. We know that it is on an island, somewhere in a tropical zone. Your wife, we hope, will be able to tell us some little point more. Since her own life is at stake, she will, I am sure, be *glad* to tell us all she can."

Torrance stopped. He looked at Virginia, then at Mention with a strange imperturbability.

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"Is everything clear now?" he finished.

"Yes," said Mention.

He felt a relentless rage. It was not the host of murders that did it, though the probable number of them did blurring things to his mind. It was not even Virginia. Thought of her predicament only made him feel cold and sick and afraid. It was the old man, the use being made of an old man and his idealism.

The ruination of an old man's wonderful crazy dream shook the very life within him. Mention felt abruptly fortified to the depths of his soul. And, just like that, he knew with an implacable determination exactly what he must do to these people, if ever the opportunity came.

Funny how long it had taken him to realize that, quite by chance, Virginia possessed all the clues to the location of the island.

They couldn't know yet the extent of her knowledge.

They mustn't know.

Mention said in his steadiest voice: "My wife woke up in Cranston's laboratory and Cranston was there. She had no time to look around, because he brought her straight home. And that, if you don't mind, is where she and I will start for now."

He pushed his chair away from the table, then hesitated, glancing at Virginia.

There was a brief silence; and then one of the blondes, not Mrs. Patterson, laughed harshly. "I notice, Professor Mention, that your wife is NOT making any move to follow you. Is it possible she INTENDS to remember having seen something?"

It was a possibility that had already occurred to Mention.

It was up to her.

Slowly, Mention gathered his forces. He looked at Virginia, and saw that her face was sheet-white. Her lips trembled, as her glance met his—and then she looked away.

Mention said urgently: "Virginia!"

Once more, she looked at him. There were tears in her eyes.

"Virginia, you've heard what these people have to say. And it isn't what you know or don't that's at stake at all It's, are you going to become one of them, or are you not?

"Don't make your decision now.

"There must be things we can do. Surely, Dr. Cranston can be reached, if we persevere. I'm certain, if we could talk to him, that he'd finally make up his mind to kill these creatures. He's been isolated. He must be made to see that his life's work can yet be rescued from these human rats, these mass killers, these—"

He paused. He whirled on Torrance. "How many," he rasped, "how many human beings do you kill every year for their internal organs?"

"About five thousand," said Torrance without hesitation. "Mostly orphans, poor people who move around a lot, and families without relatives."

"Uh!" blinked Mention.

He hadn't expected an answer.

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He had flung the question to point up a grim aspect of these people's activities. Now, he felt torn from his train of thought.

"Five thousand!" he echoed.

The total was bigger than he had ever thought. It shocked him. He had believed himself hardened to anything that might come out in this deadly interview. And he wasn't.

He felt nausea. With a titanic effort, he caught hold of himself. Realization came that there was nothing he could say that would add any emphasis to the sum itself.

He did speak, however. He said wanly: "The defense rests."

He looked at Virginia—and she smiled at him through tears. It was a dreary smile. But a smile!

"Oh, you poor fool," she said. "You don't have to argue with me. You don't have to prove anything to me. There's evil here, beyond description. Evil of that curious advanced kind, which is only amused by the word and the realization. *Look* at them!"

She waved one hand, futilely. Mention had already looked. The nine faces were twisted in nine variations of sardonic amusement. Virginia's voice burned on:

"It's become like the evil of the universe, beyond the power of individuals to resist, with one exception. Only Dr. Frankenstein can destroy the monster he has created.

"The rest of us can but try to save our loved ones from the deadly elements. Oh, Norman, don't you see—"

"I see," said Mention harshly, "that you're thinking of giving in."

"Norman," she said whitely, "they've been too frank. They've told us so much that it's obvious they don't care what we know. Don't you see what that means?"

"You're thinking of yourself when you say that," Mention said.

"Am I?" She looked at Torrance. "*Am I?*"

Torrance said: "Your wife is smarter tonight than you are, Mention. You see, she is safe. Cranston will somehow see to it that no harm befalls the few of us he thinks worth saving."

He turned towards Virginia. "If you start talking before two minutes have passed, you and your husband can go home. You will never again be bothered by us. And if we gain control of the organs, we guarantee that no harm shall befall yours. Naturally, we prefer that everybody with power should join us."

He looked down at his watch. "We do not make promises lightly, having no need for lies. It is now seventeen minutes to one. You have two minutes."

Virginia parted her lips as if to speak, and then she caught Mention's gaze. And closed them again.

She sat staring at him like a hypnotized bird.

"Don't you dare," Mention almost hissed. "In the war, we discovered that there's no compromising with such things as these.

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Their word isn't worth the uttering. If you have any information, we'll use it to destroy them."

Even now, he mustn't let them guess that they did have the information.

Torrance said drably: "The two minutes is up."

He whirled on Virginia. "You fool!" he said coldly. "You've let him condemn himself to death. At this moment," he went on icily, "you may consider that your husband has one year to live. A minute from now, it will be fifty-one weeks, and so on. If at the end of fifty-two minutes you still haven't started talking, we shall kill him within the next few days.

"In any event he's a dead man. You can save him for a year. That's final. *Missis* Mention, start talking."

Mention climbed to his feet. "Virginia," he said roughly, "let's go."

Torrance reached up, and caught his arm. "Sit down, you idiot."

Mention smashed him in the face.

He felt incredulous the moment he had done it, astounded at his foolishness. But by then, the uproar had begun.

The waiters who carried Mention outside were not gentle. Nor were they slow. Mention succeeded in shouting once: "Virginia, don't you dare!" And then he struck the sidewalk with a hard plop.

After ten minutes, Virginia had still not come out.

The minutes dragged. Twice, Mention tried to go in. But the doormen were on the watch for him.

"Not tonight, Mac," one of them said. "You've had one too many."

It was Torrance who brought Virginia out. The man looked triumphant.

"The West Indies!" he exulted. "What luck that she went out just as one of the rare twenty-jet planes passed, and that she noticed it was mid-afternoon there, but nearly noon when she got back to California. The continental time differences work in beautifully. We've got the old scoundrel at last."

He looked at Mention coolly. "It's too bad you're a returned man. We're really indifferent as to whether you live or die, but we've discovered that men who were officers in the army, navy or air force do not co-operate with us even to the extent of just minding their own business."

He finished: "Your wife talked after twenty-five minutes, and she didn't start to tell the truth till we took her upstairs to a lie detector. You'll be feeling a knife at the end of the allotted time—after which we'll force your wife to join us. Good-by."

He walked back into the hotel, with Mention's Luger pointing at him all the way. At last, gloomily, Mention took his hand out of the gun pocket.

"I don't dare," he said. "Killing one wouldn't do any good. Besides,

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I can't afford to spend the night in jail."

Beside him, Virginia said dully: "I'm sorry, Norman."

"I'm sorry, too," Mention replied gently, "for what I said to you before."

She spoke again, but this time he didn't hear. There was a clock above the ornate entrance of the hotel. Its hands showed twenty minutes to two. Mention stared at them, and calculated.

The Los Angeles-Miami rocket was only ten minutes out from its glitteringly showy launching run. It would be thirty-five minutes yet before Edgar arrived in Miami and started his inquiries.

By then, Torrance and the others, having flashed the nerve "power" way to Florida, would be on their way to the island by the fastest jet plane available.

He made sure they weren't followed, by taking three different taxis to the airport.

They were on the 3:30 rocket from Los Angeles to Miami. There was one chance, Mention realized, as he sank deeper into the cushions from the enormous acceleration. One chance.

Virginia had been *to* the island. Torrance and those eight veterans of the organization who had attended the dinner hadn't.

When he told Virginia his plan, she stared at him somberly. She said bleakly, "Suppose Edgar started home on the quarter to three, Los Angeles time, rocket."

"I don't believe it," Mention said flatly. "For years Edgar has palpitated for adventure. He'll stay till a quarter to five L. A. time, as I advised him to. But he won't go far afield. He's not that bold, not yet."

They found Edgar in one corner of the waiting room, reading a magazine.

He handed over the notebook. There were four twenty-jet planes a day in the West Indies, he gobbled, all on the same route, every six hours in both directions.

He led the way to an enormous wall map of the West Indies.

The route was marked in a white line in bold relief; and there was a tiny island shown at *the* probable time point.

In the city directory, Mention located the Miami Futurian Science Laboratories. A taxi took Virginia, Edgar and himself there. A brick cracked the glass, then sent it shattering to the sidewalk.

"Get in there, Edgar!" Mention urged. "Press button 243. And then beat it back to the airport."

Two minutes later, as the early morning sun burst through a fleecy bank of low clouds, Mention drew a radiantly powered Virginia into a doorway.

"Darling!" he said. "This is it!"

He went on doggedly: "It must work. They transported you to Cranston's home when you were just a dead body. And Cranston took you to the island in the same way. That radio impulsor inside you must build a force field all around you when you're 'charged'.

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A home of your own, a better farm, a real vacation, something to retire on—these are things worth saving for. Store up your money now while prices are high. There's a time to splurge and a time to save: today, while money's coming in, is a good time—the *right* and patriotic time—to SAVE!

4 THINGS TO DO

To keep prices down and help avoid another depression

1. Buy only what you really need.
2. When you buy, pay no more than ceiling prices. Pay your ration points in full.
3. Keep your *own* prices down. Don't take advantage of war conditions to ask more for your labor, your services, or the goods you sell.
4. *Save.* Buy and hold all the War Bonds you can—to help pay for the war, protect *your own* future! Keep up your insurance.

HELP US KEEP PRICES DOWN

A United States War message prepared by the War Advertising Council; approved by the Offices of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America

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If they could move you, then you can take me along now."

He saw the expression on her face. He said earnestly:

"Don't forget, you've been there. And you know the way at last." He pointed eastward. "The island is over there. Visualize the hill you stood on that day when you came out of Dr. Cranston's underground laboratory. You can. I know you can."

He felt her stiffen with decision. "Hold me close!" she whispered. He felt her vibrant body press against his, responsively.

Somewhere nearby an Irishman began to curse in annoyance, something about a window having been broken on his beat, b'gorra.

The officer's voice was cut off curiously. There was a sudden tingling inside Mention, thrillingly sharp. And sustained.

The sensation ended. He was standing in a room lined with glass cases, staring at an old man, who confronted them with an ax in one hand and a revolver in the other.

"I have a little system," Dr. Cranston said in a queer, tired voice. "I phone Torrance up. If I can't get in touch with him, I come here, just in case he's up to something."

He lowered the gun wearily. "Just when I'd half convinced myself that I would kill the first person who came in here, in barge two innocent people."

Mention did not hesitate. This was the man who could fool himself about things like responsibility for death.

He was going to have the chance.

Mention stepped forward and took the gun from the old man's unresisting hand.

"I'd like you," he said, "to hand me the ax of your own free will."

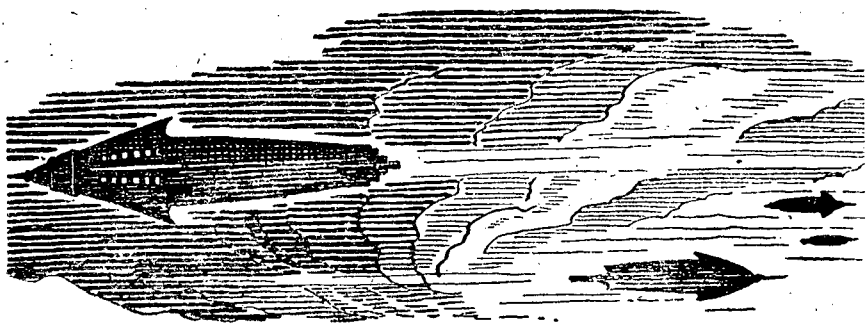
Dr. Cranston shrugged wearily. "There's nothing else I can do."

He handed over the ax. He looked suddenly cheerful. "I suppose there's nothing I can say that will prevent you from doing what you have in mind?"

"You can," said Mention grimly, "indicate those cases which you think can be left intact. And don't indicate too many."

When Mention finally put the ax aside, twenty-three compartments remained unshattered.

THE END.



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